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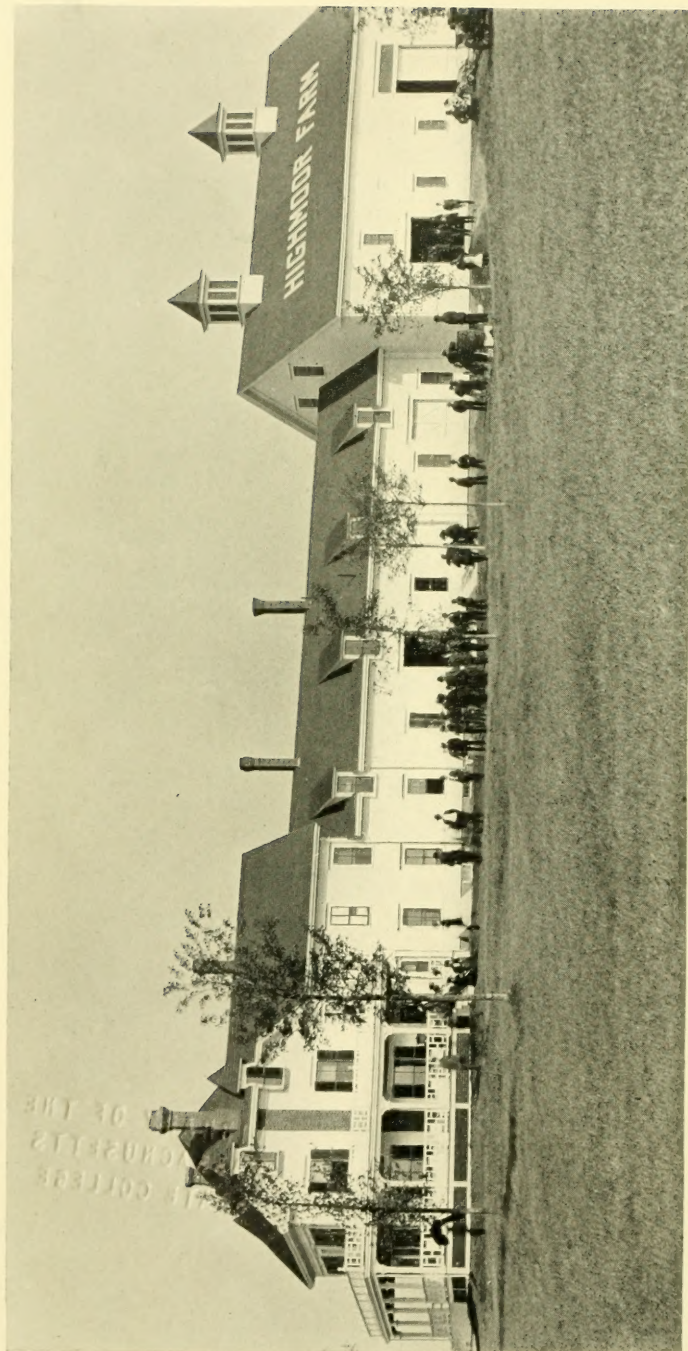








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State Farm in Monmouth, for Experimental Work.



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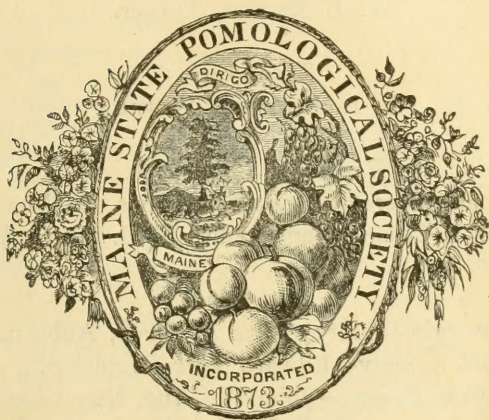
TRANSACTIONS

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OF THE

# Maine State Pomological Society

FOR THE YEAR 1909.



EDITED BY THE SECRETARY,  
W. J. RICKER.

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STATE COLLEGE

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AUGUSTA  
KENNEBEC JOURNAL PRINT  
1910

## OFFICERS FOR 1909.

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### *President.*

WILLIAM CRAIG, Auburn.

### *Vice Presidents.*

E. L. WHITE, Bowdoinham.

G. L. PALMER, So. Livermore.

### *Secretary.*

W. J. RICKER, Turner.

### *Treasurer.*

E. L. LINCOLN, Wayne.

### *Executive Committee.*

President and Secretary, *ex-officio*; Chas. E. Wheeler, Chesterville; Will E. Leland, Sangerville; F. H. Morse, Waterford.

### *Trustees.*

Androscoggin County—Silas A. Shaw, Auburn.

Aroostook County—Edward Tarr, Mapleton.

Cumberland County—John W. True, New Gloucester.

Franklin County—E. E. Hardy, Farmington, R. F. D.

Hancock County—William H. Miller, Bar Harbor.

Kennebec County—E. A. Lapham, Pittston.

Knox County—Alonzo Butler, Union.

Lincoln County—H. J. A. Simmons, Waldoboro.

Oxford County—W. H. Allen, Buckfield.

Penobscot County—Samuel L. Boardman, Bangor.

Piscataquis County—C. C. Dunham, Foxcroft.

Sagadahoc County—J. H. King, Bowdoinham.

Somerset County—Frank E. Nowell, Fairfield.

Waldo County—Fred Atwood, Winterport.

Washington County—D. W. Campbell, Cherryfield.

York County—J. Merrill Lord, Kezar Falls.

Member of the Experiment Station Council: Charles S. Pope, Manchester.

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1909-15

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## MEMBERS OF THE SOCIETY.

NOTE.—Any errors or changes of residence should be promptly reported to the Secretary. Members will also confer a favor by furnishing the Secretary with their full Christian names where initials only are given.

### LIFE MEMBERS.

Allen, Wm. H.	Buckfield	Jackson, F. A.	Winthrop
Andrews, A. Emery	Gardiner	Keene, Charles S.	Turner
Andrews, Charles E.	Auburn	Knowlton, D. H.	Farmington
Arnold, C. A.	Arnold	Lapham, E. A.	Pittston
Atherton, Wm. P.	Hallowell	Leland, Will E.	East Sangerville
Atkins, Charles G.	Bucksport	Lincoln, E. L.	Wayne
Atwood, Fred.	Winterport	Litchfield, J. H.	Auburn
Averill, David C.	Temple	Litchfield, Mrs. L. K.	Lewiston
Bailey W. G.	Freeport	Lombard, Thurston M.	Auburn
Bennoch, John E.	Orono	Lord, J. Merrill.	Kezar Falls
Bickford, Lewis I.	Dixmont Center	Luce, Willis A.	Columbia Falls
Bisbee, George E.	Auburn	Macaulay, T. B.	Montreal, Can.
Bisbee, Stanley	Mechanic Falls	Mayo, E. P.	Waterville
Blanchard, Mrs. E. M.	Lewiston	McAllister, Zaccheus.	West Lovell
Blossom, O. E.	Turner Center	McCabe, George L.	North Bangor
Boardman, Samuel L.	Bangor	McLaughlin, Henry.	Bangor
Briggs, John.	Turner	McManus, John	Brunswick
Burr, John	Freeport	Merrill, Oliver F.	Gardiner
Butler, Alonzo	Union	Mitchell, Frederick H.	Turner
Chadbourne, C. L.	North Bridgton	Mitchell & Co.	Waterville
Chandler, Mrs. Lucy A.	Freeport	Moody, Charles H.	Turner
Chase, Henry M., 103 Federal St.	Portland	Moore, William G.	Monmouth
Corbett, Herman	Farmington	Moor, F. A.	Waterville
Craig, William	Auburn	Morse, F. H.	Waterford
Crowell, Mrs. Ella H.	Skowhegan	Morton, J. A.	Bethel
Crowell, John H.	Farmington	Munson, W. M.	Morgantown, W. Va.
Dana, Woodbury S.	Portland	Page, F. W.	Augusta
Dawes, S. H.	Harrison	Palmer, George L.	South Livermore
DeCoster, Virgil P.	Buckfield	Parsons, Howard G.	Turner Center
Denison, Mrs. Cora M.	Harrison	Pope, Charles S.	Manchester
DeRocher, Peter	Bradentown, Fla	Prince, Edward M.	West Farmington
Dirwanger, Joseph A.	Portland	Pulsifer, D. W.	Poland
Dunham, W. W.	North Paris	Purington, E. F.	Farmington
Dyer, Milton	Cape Elizabeth	Richards, John T.	Gardiner
Emerson, Charles L.	South Turner	Ricker, A. S.	Turner
Farnsworth, B. B.	Portland	Roak, George M.	Auburn
Frost, Oscar F.	Monmouth	Sanborn, Miss G. P.	Augusta
Gardiner, Robert H.	Gardiner	Sawyer, Andrew S.	Cape Elizabeth
George, C. H.	Hebron	Saunders, Ernest.	Lewiston
Gilbert, Z. A.	North Greene	Seavey, Mrs. G. M.	Auburn
Goddard, Lewis C.	Woodfords	Simmons, H. J. A.	Waldoboro
Grover, Franklin D.	Bean	Skillings, C. W.	North Auburn
Guiley, Alfred G.	Storrs, Conn.	Smith, Frederic O.	New Vineyard
Hackett, E. C.	West Gloucester	Smith, Henry S.	Monmouth
Hall, Mrs. H. A.	Brewer	Snow, Mary S.	Bangor
Hanscom, John	Saco	Stanley, H. O.	Winthrop
Hardy, E. E.	Farmington	Staples, Geo. W., 904 Main St.,	Hartford, Conn.
Harris, William M.	Auburn	Starrett, L. F.	Warren
Heald, U. H.	Paris	Stetson, Henry.	Auburn
Herrick, A. A.	Norway	Stilphen, Asbury C.	Gardiner
Hixon, A. A.	Worcester, Mass	Taylor, Miss L. L.	(Lakeside) Belgrade
Hoyt, Mrs. Francis	Winthrop	Thomas, William W.	Portland

## LIFE MEMBERS—CONCLUDED.

Thomas, D. S. ....	North Auburn	Wade, Patrick. ....	Portland
Thurston, Edwin. ....	West Farmington	Walker, Charles S. ....	Peru
Tilton, William S. ....	Boston, Mass.	Walker, Elmer V. ....	Oxford
Townsend, Mrs. B. T. ....	Freeport	Waterman, Willard H. ....	East Auburn
True, Davis P. ....	Leeds Center	Waugh, F. A. ....	Amherst, Mass.
True, John W. ....	New Gloucester	Weston, Joseph ....	Gardiner
Turner, E. P. ....	New Vineyard	Wheeler, Charles E. ....	Chesterville
Twitchell, Geo. M. ....	Auburn	White, Edward L. ....	Bowdoinham
Vickery, James. ....	Portland	Woods, Chas. D. ....	Orono
Vickery, John ....	Auburn	Yeaton, Samuel F. ....	West Farmington

## ANNUAL MEMBERS FOR 1909.

Abbott, S. E. ....	Norway	Merrell, H. H. ....	Hebron
Black, H. C. ....	Hebron	Millett, C. R. ....	Mechanic Falls
Bowers, Dr. J. W. ....	Portland	Morse, W. J. ....	Orono
Campbell, David W. ....	Cherryfield	Packard, Mrs. E. L. ....	Norway
Clement & Taylor. ....	Winthrop	Perley, F. B. ....	Vassalboro
Cummings, R. L. ....	West Paris	Perham, G. W. Q. ....	Bryant's Pond
Delano, W. A. ....	Norway	Philbrook, E. E. ....	Portland
Douglass, Edward C. ....	Middleton, Conn.	Reed, R. C. ....	Temple
Ellis, A. W. ....	Fairfield	Ricker, W. J. ....	Turner
Frost, H. L. ....	Arlington, Mass.	Roberts, J. A. ....	Norway
Gallup, C. M. ....	Augusta	Ryerson, C. W. ....	Norway
Goodwin, S. H. ....	St. Albans	Sawyer, T. F. ....	Reading, Mass.
Hibbs, J. A. ....	Hebron	Shurtleff, W. P. ....	South Livermore
Hitchings, E. F. ....	Waterville	Tarr, E. ....	Mapleton
Holman, M. F. ....	Oxford	Thurston, Mrs. F. D. ....	Norway
Keyser, H. L. ....	Greene	Tucker, Benjamin. ....	Norway
King, J. H. ....	Bowdoinham	Washburn, C. C. ....	Mechanic Falls
Lang, B. C. ....	West Paris	Wilson, A. G., 33 E. Main St., Rochester, N. Y.	
Leavitt, E. A. ....	Auburn	Wyman, E. L. ....	West Paris
Lincoln, Mrs. E. L. ....	Wayne	Yeaton, G. A. ....	Augusta

## REPORT OF THE EXECUTIVE COMMITTEE.

---

A general idea of the work of the society can be obtained by reading the reports of the different officers and the papers and discussions given at the various meetings of the society.

The executive committee are glad to report a successful year for the society. All its meetings have been well attended, helpful and instructive. It is the general feeling of the board and also among the fruit growers of the state that we are entering upon a new and progressive era in horticulture here in Maine and New England and it is hoped and expected that this society will grow and its power of usefulness will extend so that every progressive fruit grower in the state will be a member and look on its meetings as a source of pleasure and profit which it will be counted a great misfortune to lose.

The finances of the society are in good condition. The permanent fund is invested where it is safe and drawing interest. The books of the treasurer have been audited and found correct and well kept.

### RECEIPTS.

Cash on hand .....	\$44 05
Interest on permanent fund .....	69 00
Merchants' National Bank, Augusta .....	5 96
Membership fees, life .....	40 00
Membership fees, annual .....	51 00
State stipend .....	1,000 00
<hr/>	
\$1,210 01	



## EXPENDITURES.

Printing and stenographic work .....	\$214 24
Speakers and hotel bills .....	231 12
Officers' expenses .....	200 92
Freight and carting .....	11 37
Premiums paid .....	297 50
Salary of Secretary .....	150 00
Salary of Treasurer .....	25 00
	<hr/>
	\$1,130 15
Cash on hand .....	79 86
	<hr/>
	\$1,210 01

## TREASURER'S REPORT.

---

E. L. Lincoln, Treasurer, in account with the Maine State  
Pomological Society.

### RECEIPTS.

Cash on hand from the year 1908.....	\$44 05
January 2, interest on First National Bank, Farmington .....	12 00
January 2, interest on Stockton Spring bonds .....	22 50
July 2, interest on First National Bank, Farmington.....	12 00
July 2, interest on Stockton Spring bonds.....	22 50
June 9, received from Merchants' National Bank, Gardiner, final dividend on stock .....	5 96
From 51 annual members.....	51 00
From 4 life members.....	40 00
From State stipend.....	1,000 00
<b>Total receipts.....</b>	<b>\$1,210 01</b>

### EXPENDITURES.

January 1, Paid Merrill & Webber, order No. 1054 .....	\$18 35
F. H. Morse, order No. 1055.....	3 25
Will E. Leland, order No. 1056.....	7 70
Charles E. Wheeler, order No. 1057.....	4 20
E. L. Lincoln, order No. 1058 .....	1 50
Wm. Craig, order No. 1059 .....	13 25
W. J. Ricker, order No. 1060.....	70
Gardiner & Morton, order No. 1061 .....	8 00
February 15, Paid Merrill & Webber, order No. 1062.....	3 50
F. H. Thomas, order No. 1063.....	4 00
C. E. Wheeler, order No. 1064.....	7 05
Will E. Leland, order No. 1065.....	4 65
Wm. Craig, order No. 1066.....	12 27
W. J. Ricker, order No. 1067.....	5 70
October 6, Paid Merrill & Wheeler, order No. 1068.....	18 00
W. J. Ricker, order No. 1079 .....	25 37
E. Belle Oaks, order No. 1080 .....	1 48
C. E. Wheeler, order No. 1081.....	2 00
F. H. Morse, order No. 1082.....	4 65
November 11, Paid E. L. Lincoln, order No. 1074 .....	12 25
F. H. Morse, order No. 1075.....	6 50
W. E. Leland, order No. 1076 .....	14 28
Norway Advertiser, order No. 1077 .....	14 00
Chas. H. Glass & Co., order No. 1078.....	14 25
J. C. Woodrow, order No. 1079.....	5 62
E. Cyrus Miller, order No. 1080 .....	29 95
W. J. Ricker, order No. 1081.....	7 05
C. E. Wheeler, order No. 1082.....	7 60

	W. J. Ricker, order No. 1083 .....	10 00	
	C. E. Wheeler, order No. 1084 .....	4 75	
	Wm. Craig, order No. 1085 .....	10 25	
November 12, Paid	John A. Woodman, order No. 1086 .....	59 50	
	R. L. Cummings, order No. 1087 .....	16 00	
	R. L. Cummings, order No. 1088 .....	9 00	
	L. H. Cushman, order No. 1089 .....	1 50	
	J. A. Roberts, order No. 1090 .....	3 00	
	W. W. Twombly, order No. 1091 .....	3 50	
December 13, Paid	Canadian Express, order No. 1092 .....	25	
	Mrs. George Cummings, order No. 1093 .....	10 00	
	J. W. True, hotel, order No. 1094 .....	3 00	
	Auburn & Turner R. R., order No. 1095 .....	69	
	Maine Telephone Co., order No. 1096 .....	20	
	Mrs. J. W. True, order No. 1097 .....	1 35	
	W. E. Leland, order No. 1098 .....	4 00	
	W. J. Ricker, order No. 1099 .....	156 25	
	W. J. Morse, order No. 1100 .....	3 75	
	Chas. E. Lewis, order No. 1101 .....	5 40	
	O. A. Johansson, order No. 1102 .....	5 20	
December 18, Paid	C. L. Davis, order No. 1103 .....	2 00	
	W. D. Hurd, order No. 1104 .....	42 32	
	R. L. Cummings, order No. 1105 .....	6 00	
	E. H. Morse, order No. 1106 .....	13 00	
	Harry L. Plummer, order No. 1107 .....	10 70	
	Maine State Bookbinding Co., order No. 1108 .....	27 90	
	V. R. Gardiner, order No. 1109 .....	10 31	
	E. L. Lincoln, order No. 1110 .....	27 00	
	M. Dunnett, order No. 1111 .....	6 95	
	Wilfred Wheeler, order No. 1112 .....	10 20	
January 13, Paid	Dr. G. M. Twitchell, order No. 1113 .....	5 00	
	Merrill & Webber, order No. 1114 .....	3 75	
	Treasurer of the State of Maine, order No. 1115 .....	29 56	
	Premiums awarded, order No. 1116 .....	297 50	
	E. P. Mayo, order No. 1117 .....	10 00	
	W. H. Cornforth, order No. 1118 .....	63 25	
Total expenditures .....		\$1,130 15	
Cash on hand .....		79 86	
			\$1,210 01

## PERMANENT FUND FOR THE YEAR 1909.

December 31, By members as reported for the year 1908 .....	\$1,750 00
Fees received for the year 1909—life members .....	40 00
Total permanent fund .....	\$1,790 00

## PERMANENT FUND INVESTED AS FOLLOWS:

Four shares stock First National Bank, Farmington .....	\$400 00
Two bonds Stockton Springs, at cost .....	970 00
Deposit in Savings Bank .....	340 00
Due permanent fund, year 1908 .....	40 00
Due permanent fund, year 1909 .....	40 00
	<u>\$1,790 00</u>

Respectfully submitted,

ELLIS L. LINCOLN,

*Treasurer.*



## ANNUAL MEETING, NORWAY,

November 9, 10, 11, 1909.

Meeting called to order by Pres. Craig. Raymond Reed and Ora Blossom appointed to distribute ballot slips and collect ballots. Will E. Leland, Sangerville, and W. E. Leland, Mechanic Falls appointed to count votes. The following officers were elected:

President—G. M. Twitchell, Auburn.

1st Vice-President—H. L. Keyser, Greene.

2nd Vice-President—G. L. Palmer, So. Livermore.

Secretary—E. L. White, Bowdoinham.

Treasurer—E. L. Lincoln, Wayne.

Member of Executive Com.—E. F. Hitchings, Waterville.

Member of Experiment Station Council—C. S. Pope, Manchester.

### TRUSTEES.

Androscoggin County—Silas A. Shaw, Auburn.

Aroostook County—Edward Tarr, Mapleton.

Cumberland County—John W. True, New Gloucester.

Franklin County—E. E. Hardy, Farmington, R. F. D.

Hancock County—William H. Miller, Bar Harbor.

Kennebec County—E. A. Lapham, Pittston.

Knox County—Alonzo Butler, Union.

Lincoln County—H. J. A. Simmons, Waldoboro.

Oxford County—W. H. Allen, Buckfield.

Penobscot County—A. A. Eastman, Dexter.

Piscataquis County—C. C. Dunham, Foxcroft.

Sagadahoc County—J. H. King, Bowdoinham.

Somerset County—Frank E. Nowell, Fairfield.

Waldo County—

Washington County—D. W. Campbell, Cherryfield.

York County—J. Merrill Lord, Kezar Falls.

Voted that vacancy of Waldo County be filled by executive committee.

## ADDRESS OF WELCOME.

J. A. ROBERTS.

*Mr. President; Members of the Maine Pomological Society;  
Ladies and Gentlemen:*

The task appointed to me here this evening is truly a pleasant one, and I rejoice that I have the opportunity once more to bid you welcome in this hall and in this capacity.

The purposes of the Maine State Pomological Society are of the highest. If that organization does its full duty, and if it could extend its work more broadly, it would affect the interests and welfare of our state very largely. We are glad to have you come here. Oxford County is something of a fruit growing section. We raise here a few apples. We raise here, too, some good apples, as the New England show at Boston proved. And our apple growers in all this section are glad to have you come and give them instruction. They are glad to have you bring here your practical men, men who have had large experience in orcharding. They are glad to have you bring scientific men, men who have given their lives to a study of the questions which underlie this business. And our people are hoping that out of this meeting there will come to them much good and much value; that you will leave behind you not only this pleasant occasion, but that you will leave words of wisdom and words of cheer. My friends who are in this business of growing fruit all realize as well as the fruit growers in other parts of the state, that for the last two or three years the work has been hindered and has received, I might almost say, a staggering blow. But for all that, I think that the people in our section, and I hope it is so in the rest of the state, still have faith in the industry of producing fruit in Maine. I think perhaps it is a fair proposition to say that our fruit raising people are en-

gaged in a tremendous struggle. I think perhaps it is a fair proposition for me to say that they are entering upon a new era. They recognize the fact that old conditions and old methods are passing away, and have got to pass away. They are beginning to realize the fact that new conditions and new methods are coming in, and must come in, in order for them to be successful. And I believe that the people of Oxford County, as well as the people in the other counties in the state, have the pluck and perseverance to carry forward this work of producing fruit as beautiful as you see here tonight.

Now, my friends, I am not going to take up the time, but I do want to say this,—that in all your words of wisdom, while you are telling us about the insect pests and the difficulties that are around us everywhere, and in manifold forms, I hope you will not dwell too much on those. Do not discourage the young people from planting trees. They realize something of the difficulties you have told us so much about,—the gypsy moth, and the brown-tail moth, and all the other insects and fungous diseases, and many other things. You have made the road ahead look so hard to travel that many young men are discouraged from entering thereon. Show them this beautiful fruit. Tell them that it was raised here on the hills and in the valleys of this state. Tell them how it is done, and that much of it can be raised. Show them those things. Make the industry pleasant to their eyes, and show them that it can be made profitable.

Now as I said before, we are glad to welcome you here. We trust that your stay with us will be a pleasant one. We have a beautiful village, and we trust that while you are here you will have an opportunity to go out somewhat and see what we have in the way of manufactures and other matters of interest. We hope that your stay with us this time will be so pleasant that you will want to come again in the near future.



## RESPONSE.

EDWARD L. WHITE, Bowdoinham.

*Mr. President, Ladies and Gentlemen, and Citizens of the Town of Norway:*

I need not say that it is a great source of pleasure to me to express the sincere thanks of the Maine State Pomological Society for your kind welcome to us within your borders. I might, by the consent of the members of the Pomological Society, relate to you the history of your invitation to the executive board of this society. I might say there were several other invitations, but it was the opinion of one and all, spoken right out, "Let us go to the town of Norway. We will certainly have a good time." And when I say that, I think I express the opinion of all the members of the Maine State Pomological Society. And in a simple, friendly way, I think I can sincerely say that it has been one of the greatest aims of the Maine State Pomological Society to get within its membership the growers of fruit. I noticed a short time ago that a committee picked out to judge fruit was picked out in this way,—a wholesaler, a retailer, a consumer. Where does the producer come in,—the grower of fruit?

It has been told me in the history of grape fruit that the producer raised the fruit, and then he had to educate the consumer that he needed the fruit before the wholesaler and the retailer would handle it. And when we come to the McIntosh apple, and look back a few years ago and find it way down among the lowest and now way up among the fancy articles, we can say the same of that as we could of the grape fruit. It was something that the grower had and the consumer didn't know anything about it. The grower knew it was good to eat, and the consumer didn't. Therefore the producer had to use his

utmost means to put it into the markets and educate the consumer that he had something good to eat.

So in the work of the Pomological Society, I think the greatest and the most important thing is to educate the grower. I think he is the principal factor in regard to this branch of agriculture. When we look over the State of Maine and see an orchard cultivated and taken care of, what do we see in the owner of that orchard? Is he a narrow minded man? Is he an undesirable citizen? Is he diminishing the wealth of his town, county and state? I think not. I think you will find that he is a broad minded man, a man that is bringing his town up, and his county and his state. And it is the aim of the Maine State Pomological Society to make not only Oxford County, but the whole state, one of the best fruit growing sections in the world. And our fruit is equal to it if we who are young men will only take hold of the work. The obstacles are nothing but that we can overcome, and it needs the young men and the young ladies of the good old State of Maine to take hold of this work and make it better and stronger than it is now.

Again let me say to the citizens of the town of Norway, the Maine State Pomological Society sincerely thanks you for your welcome within its borders.

## ANNUAL ADDRESS.

By PRESIDENT W. CRAIG, Auburn.

*Ladies and Gentlemen:*

Once again the busy growing season has gone by and we, The Pine Tree State Apple Growers, have come together for renewed acquaintance and to vie with each other in good natured rivalry for the highest honors. All day smiles should cover our faces, for although our crops were jeopardized by hail, drought and storm, nearly all those who had a care for the orchard were rewarded with a bountiful harvest; such is the natural law of compensation.

Some may plead that this was their "off year," but let me tell you now that (barring extremes in weather conditions) if you are up-to-date in your methods there will be no off year.

In looking over our past reports you will find that this society has been doing good work and advocating better methods for over a quarter of a century, and it is well to stop and ask ourselves in plain English: "Are we as a people deriving sufficient benefit for the outlay, or in horticultural terms, has our pomological tree been fruitful and yielded up an annual crop of useful inspiration?"

Is our fruit grown, handled and packed better than twenty years ago? Are we getting more money from our orchards? If not, why? Does the trouble not lie with us individually in neglecting to put into practice the good things we learn at meetings of this kind? Are we not prone to applaud the lecturer who advances new ideas and say that it is "fine," but to go home and do much of our work in the same old way.

The *valuable programme in store* for us at this meeting will prove to be a guidepost towards greater achievements, and may I ask you in good Episcopal terms to "read, mark, learn and



inwardly digest" it so that all can turn it to valuable account in securing better fruit, better prices, better education for our families, better homes, better people; and better people means a better world to live in.

We must not be discouraged, however, because the real spirit of investigation and progress is in the air. It was an inspiration to see many of the Grange and fair exhibits this year, a large percent of them being placed on the tables without expectation of a premium.

For the good of our society I would suggest that in the future we arrange prizes to encourage box and barrel competition, gradually eliminating the plate exhibits, which encourage so many undesirable varieties. Furthermore five specimens are (it is said, but I hardly think it is true) too easily borrowed for the occasion.

Display exhibits in box and barrel competition will encourage apple dealers to attend our meetings, thereby developing the commercial side as well as the æsthetic.

Two years ago you honored me. I appreciate your confidence and thank you. I did the best I could under existing conditions. I know not what is in store for me, but this I do know, that if my future path be laid out for me in Maine it will be through pleasant places.

Always let the customary horticultural good fellowship reign in your midst and may showers of blessings attend your efforts.

"What plant we in this apple tree?  
Sweets for a hundred flowering springs,  
To load the May wind's restless wings,  
When from the orchard row, he pours,  
Its fragrance through the open doors:  
A world of blossoms for the bee,  
Flowers for the sick girl's silent room,  
For the glad infants, sprigs of bloom  
We plant with the apple tree."

## REPORT OF SECRETARY.

W. J. RICKER, Turner.

*Ladies and Gentlemen:*

Last year, when we were in Waterville, we had two things in our minds that we wanted to accomplish during the coming year. One was to get an experimental farm where orchard research could be carried on. The legislature of 1907 was asked to provide such a farm, but they in their wisdom referred the bill to the next legislature. The matter was left to Dr. Turner to bring before the legislature of 1909. This he did, and with the help of a large number of interested members we got the bill passed, and we have now Highmoor Farm. We are today just as much interested in an experimental farm as we were a year ago, but perhaps interested in it in a different way. Last year we were interested to get the farm. This year we are interested to see what we can get out of it.

The other thing that we were particularly interested in was to get some laws by which we could regulate the standard of box and barrel and provide suitable grades for packing and marking our apples. Dr. Twitchell had long been a committee of one to keep us informed on the doings of other states along this line, and to recommend suitable legislation. After talking the matter over it was left with him, and he drew up a set of laws and submitted them to the executive committee in December. The executive committee went over them with him and recommended that he present them to the legislature. It is unnecessary to say that the laws, after being changed a little were passed, and we today, if we are living up to the laws of the State of Maine, are packing our fruit in standard boxes and barrels, and marking them either "Fancy," "Ones" or "Twos" and marking them in large letters "Maine Apples."



Meeting, Maine Pomological Society, Highmoor Farm, October 7, 1909.





The general workings of the society have been about the same as usual. We have held two field meetings, one in June at East Hebron, in connection with the East Hebron Grange and one at Highmoor Farm in October. I presume many of you were at these meetings. They were simply ordinary day meetings, the forenoon given over to orchard research and demonstration, the afternoon filled up with a program. The Highmoor Farm field meeting, thanks to Dr. Woods, I think was the largest and most profitable meeting the society ever had. Dr. Woods took full charge of the program in making the arrangements, and we certainly appreciated it.

We have had, I think, four meetings of the executive committee this year, one in December, closing up the business of last year and making plans for this year, one in Augusta in February, one at East Hebron, and one at Highmoor, but no special business aside from the making of the plans for this annual meeting.

DR. TWITCHELL: I wish I could feel that I was entitled to the credit which the secretary has given me, but justice demands that credit for framing the law which we have on our statute books be located elsewhere. It is true that there was placed in my hands for two or three years the work of arousing sentiment in the pomological societies of New England, with a view to uniform legislation, but credit for the law which was prepared and which has met the approval of our best fruit men belongs to the fruit growers of Oxford County, and I want them to have it.

PRESIDENT CRAIG: I certainly was pleased to know and see the interest that Oxford people took in that work last spring, but I don't know whether I should go quite as far as Dr. Twitchell in stating it was all Oxford County. I think Androscoggin County had a little share in the business, and we don't want to feel that anybody had any special monopoly. We are practicing co-operation. We are all working together, and that is the way we want to do in Maine. To get what we are after we must all work together.

The following resolutions were presented by the committee and adopted.

Whereas, the State of Maine has purchased in the town of

Monmouth a farm upon which there shall be conducted experiments in orcharding by the Maine Agricultural Experiment Station;

And whereas, in order that the fruit growers of the State may derive the largest amount of advantage from these experiments it is necessary that they visit the farm frequently;

And whereas, this farm is situated on the Farmington branch of the Maine Central Railroad about half way between Leeds Junction and Curtis Corner Station, be it

Resolved, by the Maine State Pomological Society in convention assembled at Norway, that the Society appreciates the courtesy extended by the Maine Central Railroad at the recent field meeting in stopping the trains at Highmoor Farm and in furnishing transportation at reduced rates. And be it further

Resolved, that the Society respectfully ask the railroad to establish a flag station at Highmoor Farm at which at least the morning up train and the afternoon down train will stop on signal. And be it

Resolved, that the Secretary of the State Pomological Society be directed to send a copy of these resolutions to the president, general manager, and general passenger agent of the Maine Central Railroad and to the superintendent of the Portland division.

Respectfully submitted,

GEO. M. TWITCHELL,

JOHN W. TRUE,

WILL E. LELAND,

*Committee on Resolutions.*

## BETTER FRUIT FOR NEW ENGLAND.

(Stereopticon Lecture)

E. CYRUS MILLER, Haydenville, Mass.

*Mr. President, Members of the State Society, and Friends:*

I assure you it is a great pleasure to be here tonight. I have been in the State of Maine before, and have always found it most pleasant and agreeable. I want to bring to you the greetings of the fruit growers of Massachusetts, and assure you that

not only in Maine is the interest in fruit growing increasing, but also in Massachusetts, and in fact in all the New England states. I believe, as one of the speakers here tonight said, we are on the edge of a new era in regard to agricultural matters, and particularly in regard to the growing of fruits.

Maine is peculiarly fortunate I believe. It has a great many things in its favor. You have in the first place this society, where you can focus so much of your strength and efforts for improvement and betterment of conditions in your state. Through this society you can get legislative action better and other things which are along the line of improvement. You are fortunate in having an agricultural newspaper in your state which is so well suited to conditions as they exist here. We are favored of course in having in our eastern states agricultural newspapers of the highest class, both as to the subject matter which they contain, and the editorial treatment of those papers. We have the Rural New Yorker, one of the best papers in the country. We have our American Cultivator. We have the New England Homestead. We have the New England Farmer. We have these papers which give local color to our agricultural efforts and work. And we are peculiarly fortunate in having the assistance of this agricultural press to instruct us, to encourage us and to help us along all these lines for the betterment and uplifting of our agricultural work.

You are fortunate here in the State of Maine in having three other things, which to me seem very important and vital. At the conference of governors, held at Boston about a year or more ago, one of the suggestions which I had to offer was that each and every state in New England should have an official something after the type and style of your state entomologist, someone whose work it should be to instruct and to counsel with the people of the state along that particular line of agricultural work, and give them the best instruction which they could. You here in Maine have an official of that type in Prof. Hitchings, and I have no doubt whatever that he has been of great assistance and benefit to the pomological life of this state. We all know what he has done for your fruit growers in organizing your efforts and presenting specimens of your wonderful fruit at the Boston Fruit Show. And Maine is to be congratulated in having such an official. You are to be congrat-

ulated in having such fruit to present there, and then in having a man who is willing to take off his coat and go to work against seemingly large obstacles, and formulate and systematize the work and put it before the people at that show.

You have also what has been referred to tonight as your state experimental farm. Now in that matter you are distinctively ahead of any other state in New England, and I want to say right here that I believe that is going to be an immense benefit to the State of Maine. If it is ably and honestly and efficiently conducted it may be one of the most potent factors in the development of pomological matters in this state. And I beg to caution you to keep your eyes upon it and see that it is made a power not only in agricultural matters but also in horticultural affairs.

Then another point in which Maine is distinctively in advance of other states in New England is in the matter of state legislation regarding the grading and packing of fruit. This is another matter upon which New England should act as a unit, but it seems that you are a little bit in advance of the procession and that you have set the pace in that direction. And while perhaps your bill may be immature and incomplete, I believe it is the entering wedge and that it will be a great benefit to the fruit growing interests of Maine, and I congratulate you in having it. It is going to work hardship to no man or fruit grower. Those who have objected to any such measures are those whose objection should not carry great weight. Those who are honest in their desires to have the fame of Maine fruit known abroad, and favorably known, have been in favor of it.

Now as to conditions which enter into the making of better fruit in New England, I want to say just a few words on the economic side. And first of all, we who are engaged in agriculture and horticulture should have a larger faith in our own soils and climates and conditions. We do not realize the possibilities that are in our soil, and in our climate, and in the conditions about us, such as markets, etc. And last of all, we should have faith in ourselves to work out those things.

Coming down from Boston I read a chapter in a book which I purchased there on a miracle of self confidence. And I wish everyone could read that chapter. The book is called "Peace, Power and Plenty," and although it deals with economic sub-



jects, I believe it may very well be read by anyone engaged in agriculture, horticulture or any phase of work in life. The important thing is the faith in ourselves to work out these problems, and we have just as many advantages here in New England as there are in any other section of the world. I say this is the starting point in regard to the growing of better fruit in New England, faith in ourselves that we can do it.

All one has to do is to walk about this hall, and cast his eyes upon this magnificent exhibition of fruit, which we know is not only fair to look upon but is of the best quality, to see that something is fundamentally lacking in fruit from other sections of the country. In the middle West they have varieties of fruit that cannot be compared with the kinds that we have in New England. In the far West they have apples that are fine in appearance, but do not have the intrinsic merit that our fruit in New England has. And so our fruit here has the double advantage of fine appearance—something that will sell on its looks—and also the merit of quality.

Do not fear that the apple business in particular will be overdone. We have heard that cry for years, and yet what do statistics tell us about the production of fruit? Since the year 1896, when we had a large crop, it has been decreasing every year, and on the other hand our markets have been increasing. We formerly thought a great deal about the market across the water, but today we find that the great middle West is proving a large market for our apple products. In fact this year they have more buyers in the East than ever before. And I might say right here that the apples grown in our own orchards were bought by a Maine man and shipped to the West, and a large part of the fruit in western Massachusetts has gone into the middle West.

Our fruit has two advantages in that section. It has the quality that appeals to them. They have no fruit of quality such as the Baldwin or Greening or Spy. And then on the other hand there is the matter of sentiment. We find in the middle West a large number of sons of New England, and they know what the Baldwin and the Greening and the Spy are. The names are trademarks, and they ask their wholesalers and their retailers and their fruit-stand men for apples from the East,

because they know them by association and reputation, and they know they have the advantage of fine appearance and fine quality.

Now one more thing about apple orcharding, and that is, with the exception of the hay crop, there is no crop that may be grown in New England, or in Maine, to which the soil is so well suited as the apple crop. And further than that, there is no acre of land used for agricultural purposes that may be made so valuable as an acre of well cared for and well managed apple orchard. I know of orchards that have been paying six, eight and even ten per cent on a thousand dollars an acre ever since they were twelve years old, and of just the ordinary kind, that is, the kind which is not recognized as the highest degree of excellency. If we took the McIntosh apple, which is selling at the rate of four, five or six dollars a barrel, I would hardly dare to state what the results from an acre of that variety might be.

Now I want to consider briefly a few of the fundamentals that underlie practical pomology. It seems to me that the starting point in the growing of better fruit, should be the improvement of our orchards as they stand today, in other words, in a large number of cases, the renovation of our old orchards, the renovation of trees and orchards which have stood by the roadside and in the fence corners, and been more or less neglected. Isn't it really a marvel to think of our raising such fruit as we do raise, under conditions of comparative neglect? If such fruit as we do get can be grown under such conditions, what are the possibilities, I ask you fairly and plainly? If we shall adopt more modern methods of producing these articles; if we shall feed our trees, or if at least we shall produce an environment about them whereby the plant food that is in the soil, or that may be applied to the soil, shall be made more easily available for those trees; if we shall scrape off that rough and rugged bark that harbors insects, that prevents new development of the bark,—if we shall scrape off that loose bark and give the trees a different appearance; if we shall climb into that tree and cut out the portions of surplus wood, the dead and dying limbs, those that are affected with canker, and revive the tree and put it in better physical condition to produce fruit, and then last but not least if we put on a spraying mixture which

shall control, or eliminate the multitude of insects and fungus pests which we have, what, I ask, are the possibilities?

Our old orchards are a serious blemish on our landscapes. There is nothing artistic about them. A forest of fir, pine, spruce or birch, is far more artistic on the landscape than these old scraggy, decrepit apple trees. And so I ask you, if you cannot make them over, or have not the interest to make them over, and to make them more serviceable to you, and give you more pleasure, to say nothing about the profit, to put them into cord wood. By so doing you will eliminate a part of the apple crop that doesn't bring you profit; neither does it bring credit or fame to your state.

You should extend your period of pruning of those trees over a period of three years or more. Do not try to do it all in one year, but extend it over a period so that the tree may not be too much disturbed, and as you cut off a limb here or there, you may seal over the wounds and keep your tree in a good healthy condition. And at the end of three or four years you will have a tree, if you cultivate it and feed it and prune it properly, that will be in condition to be a source of pleasure and profit to you. Of course, if the trees are too closely planted, as is the rule in many cases, it is the wiser plan to cut out every other tree. If you have too many varieties and desire to grow apples on a commercial scale, of course the best plan is to cut out those varieties which are not of known kind and excellence. The market today is calling for relatively few kinds of apples, but it wants those apples of the highest grade, and the higher the grade and the larger proportion of high grade that you have the greater amount per basket or barrel you can get for them.

The spraying of the fruit is very important. However favorably located you are, I believe that the quality of the fruit may be improved by putting on a coating of spraying mixture. The apple tree should be sprayed when it is dormant. I believe that such spraying mixtures as lime and sulphur or sulfocide will work great benefit to trees. They are not only cleansing but they are invigorating. If you have never tried it I beg of you to do so. I am speaking from my own experience, and I would no more neglect winter spraying of our trees than the summer spraying with arsenate of lead or similar preparations.

Now I propose through these pictures on the screen to take you on a short visit to our hillside orchards. And I want to say right here, these orchards have been developed in connection with other forms of farm work, particularly the dairy industry. And one reason why I feel so strong in urging upon the farmers of New England to take up apple growing is because there are so many people who are engaged in dairying, and the dairy may be made a most valuable adjunct to the development of the orchard. It may be made a source of income while the trees are growing and attaining bearing age. And after that time comes and the orchard becomes established, or at least comes to a certain stage of development, I believe all these other things may be eliminated and the orchard may be relied on entirely for an income. That is one way of developing the orchard. The commercial way would be to eliminate everything else and give the whole of the land to the orchard from the start. But the most practical plan to bring before the farmers of New England, I believe, is to place the orchard in conjunction with some other line of effort, because the average farmer hasn't the capital with which to branch out and make orcharding a single line of work. That was the condition of our farm. We worked along developing new land and depending upon the dairy and some market crops with which to grow our trees and grow our fruit.

The first picture that is thrown upon the screen is the picture of our packing house. This is the second story of it in which we usually store our fruit when it has been sold, and in which we sort and pack.

Here is shown a photograph of the truck upon which barrels are to be loaded and taken to the station. We are fortunate in our location, being within a stone's throw of the loading point, which is a very important factor in reducing the expense of our operations.

You should see the ten-year-old Baldwin orchard. It has just about reached a profitable bearing stage. Up to this time we have utilized the land in between the rows in growing hoed crops like potatoes and corn, and a very short rotation of grass. From now on there will be absolutely no crops grown in this orchard or in any other portion of our orchards that are in bearing condition. I believe so strongly in the principle of cul-



tivation in the growing of apples that I am eliminating everything in the orchard where the trees are of bearing age except the apples.

Question. How far apart are those trees?

Ans. Our rule in planting trees is forty feet between the rows and thirty-five feet between the trees in the row. That applies to Baldwins. Where I inter-plant, as I have in some cases, Baldwins and Wealthy, I plant thirty feet apart. But after the Wealthies are taken out it will leave the Baldwins sixty feet apart. And I think I will show you later, by some of the photographs of trees that were planted twenty-two years ago, that sixty feet will be none too far, looking ahead and allowing the same rate of growth to continue as has been made in the past.

We have next a picture of one of a block of trees that has been planted five years. I buy the best two-year-old trees that I can buy, and buy of a good, reputable nursery firm, and specify that only good, healthy, vigorous trees shall be furnished. In the West they talk a great deal about the large growth which their trees attain. I claim that here in the East, if we give the proper treatment and adopt intensive methods of culture, we can grow trees of practically the same size in the same length of time. I believe in growing a tree as rapidly as you can grow it and still mature the wood for the winter. I cease cultivation of all kinds along in mid-summer, and it is a very rare thing to have any winter-killing whatever.

Here is a type of tree that is to be avoided. I think you will agree with me in that. And still how often, upon our country side, do we find trees of this type, where the art of pruning is unknown and where the trees are pruned until they look more like a lion's tail than anything else; where the apples instead of being where they can be easily reached by a picker, are found clear up on the tops of the trees and the bearing surface of the tree is very much restricted. The expense of spraying and picking reduces the profit to the very lowest possible point. I ask you to avoid any such methods of pruning as that, and I think the object lesson will show you conclusively that they are to be avoided. The lower branches, in my opinion, should be pruned so that when they are loaded with fruit they will just about touch the ground.

This view shows you the spring method of treatment of the orchard, and how we plow between the rows in the springtime. Nearly all of our orchards are on more or less of a hillside. The orchards themselves are located upon a kind of over-crested hill, having all exposures and all grades, and this is a moderately steep grade. We plow between the rows, going as close to the trees as we can get comfortably with horses, and I think close enough. In trees of that age, which are about twenty years old, the root system becomes so extended that the whole surface of the ground is covered with a net work of roots. The strips on the side hill serve to hold the wash of the land, and also serve to hold the trees in a certain equilibrium by keeping the fruit upon the trees and allowing it to color more highly than it would if entirely clean cultivation was practiced.

Question. That is on a hillside. Now if you plow that a number of years how would you avoid ridging on the upper side of the row of trees?

Ans. The very first step after plowing those strips between the trees is to level that land off and fill in the open furrow on the upper side and throw in furrows that are plowed out on the lower side. Of course that is quite a bit of work, but it is absolutely essential if you desire to keep your land level so that when you put on a cover crop and roll it down you have everything in nice shape.

Question. Will not a disc harrow do the work cheaply, and as well, instead of plowing?

Ans. A double action cutaway harrow would, such as I am using now. I don't think very much of a disc harrow, because it leaves the land uneven, but the double action cutaway harrow I consider a most valuable tool for any farmer's use.

Question. What cover crop do you use most?

Ans. I use a cover crop of clover and barley in mid-summer.

Here is a picture of a two-year-old orchard. In this section of orchard we have been growing corn. I cultivate the young orchards for about four years, growing potatoes, corn and sometimes tobacco. I have grown tobacco up to within a few years, and sometimes market garden truck, like cabbages or tomatoes.

The next slide shows an orchard, practically the same block of trees you were shown in two other views. It is in a differ-

ent part of the orchard and at a different season. This was in the fall after the fruit had been taken from the trees. The trees vary in type, but the straight type predominates.

Now we come to another proposition. That is as the land looks frequently in our section before it is taken in hand at all. There is a section that a year ago, just about this time, I was busily engaged upon clearing, a section of about five acres in area, a rough and rugged piece of land on the hillside, as you see. I went to work and cleared those stones and built seventy or a hundred rods of wall on the lower side, removing all the surface stones at first and then putting a plow in and having the plow followed by two men with bars, taking out the stones, and this spring I planted a section of it to young trees and planted that area to corn. And I had a beautiful piece of corn on that field. I also had a splendid growth upon the young trees. So you may see from that photograph the condition of the land where my orchard had been practically made. It had to be worked slowly and a great deal of expense was involved. But the results have justified the expense, and it takes but a very few years in which to get a valuable and profitable orchard.

Here you see a picking scene, showing the low-headed trees and the ladders placed upon them and the pickers ready for work with their baskets. The picking of the apples is the most interesting and fascinating part of orcharding for me.

The next view shows the larger orchard in the dormant period. It is during the latter part of the dormant period that I do most of the pruning. I used to do it in the winter, but lately I do most of it in late winter or early spring.

Here is the spraying outfit which we use, the largest size hand pump, with a tank holding two hundred gallons. Instead of a tower, we utilize a painter's ladder bolted to the wagon upon which a man may reach the tops of any trees which we have.

We now have a close view of one of the trees, showing it in fruit, and here is where we come close to an illustration of the possibilities in apple culture. Here is a tree which two years ago produced something like ten barrels of apples, selling at that time at \$3.00 a barrel. This year we had ten or more barrels from that tree, selling at \$3.25 a barrel. Think what the returns would be from a whole orchard at that rate, counting thirty trees to the acre! And what has been done there may

be done in other places. It is simply a question of applying systematic, intensive methods to the care of the tree.

The next view, taken in the fall, shows a tree that has been planted two years. Of course that tree will look different when it is headed back in the spring. From one-third to one-half of the top will be taken off, and the result will be to make it lower headed, to make the top more bushy and more stable, and give a tree that will have a greater resistance to wind and storm, and also have capacity for bearing a large quantity of fruit.

Question. Would you cut out any of the limbs on that tree next spring, or only cut back from the top?

Ans. I thin out each year everything that is necessary to come out. Of course what might want to come out next year can be left this year. Keep the center of the tree well cleaned out. In starting a young tree I aim to have an open center; to build, as it were, a frame work around the center of the tree, never having an upright, because it is the upright that makes the tall trees. And if you have an open center you can train your trees low much more easily than if you have an upright.

Here we have an orchard equipment, as far as the wagon, barrels, men and ladders are concerned. Such a wagon as that I consider most useful in an orchard. The wheels turn under the body. The tires are wide, and although it may draw a little harder for a team, still you can go about through the orchard much more easily than with a high wagon. It has also a long body, holding something like eighteen or twenty barrels, which is quite essential.

This slide gives a front view of the building which you saw on the first slide that was upon the screen. This is a view from the street side, showing you a front elevation of the building. This building is something like 40 feet wide and 100 feet long, with practically three stories for storing apples. The lower story will hold something like 4,000 barrels, the second story 3,000, and the top story will hold 2,000 or 3,000 barrels. Of course we haven't that number yet but I anticipate it within a few years.

Here is another picking scene, showing the barrels distributed and the pickers at work. My way of managing the picking is to have ten or a dozen men and take two rows of trees, placing the barrels between the rows, and work my men right

along those two rows, keeping them together so I may have my eye upon all operations and see that they pick the apples carefully and do not leave any apples on the trees or break the trees.

We now have a picture of a tree which has been planted four months on a section of land which the winter before was covered with forest. This is a type of land which we are using. This tract of land was literally a forest, from which was cut hundreds of thousands of feet of lumber and a great many cords of wood. In the early springtime the brush was burned, and the trees were planted right among the stumps and stones. No effort was made to remove a thing except that in the spring from this section were taken enough stones to build quite a piece of stone wall. Since this time, which was two years ago, the piece has been pretty well cleared of stones, but the stumps are still there. The trees are growing. Of course the methods of caring for trees under these conditions are entirely different from those where you put in a plow and harrow. I grubbed about them with a grub hoe, putting on a bushel of stable manure to every tree, and the result has been, I have obtained a very fine growth on those trees.

Here is another of a block of 600 Baldwin trees, showing them in fruit. The limbs are low and it is easy to gather fruit from such trees. Old men or children can pick fruit from such trees, and pick it as cheaply and as easily as an active man can from a ladder.

This is an interior view of the storage building. Here you see a room where we can easily handle 3,000 barrels of apples. In this room there are something like 1,000 barrels. And a place like this or a storage house of some kind, in my opinion is most essential for anyone engaged in apple growing on any large scale. I have tried all ways for packing apples. I have tried packing them in the field and packing them inside, and I am firmly convinced that with me, and under our conditions, it is far more satisfactory to pick the apples and put them in a storage building, and then at a later time, at my convenience, pack and ship them. If you pick and pack at the same time in the orchard, you run into periods of wet weather. You get your barrels wet and get them out of shape. You are delayed in your work. Whereas, when you are picking you can give all your energies to that operation, and then, when you have



your apples under cover, you can pack when it rains, and when the wind blows, and when it is pretty cold outside. This method I believe in most thoroughly.

This picture shows an orchard in bloom. A more beautiful picture in nature I believe was never looked upon than an apple orchard when in full bloom. It is not only beautiful to the eye, but fills the air with fragrance. As I go into the large cities and see the brick and stone buildings, I am always thankful that I am a farmer. I enjoy the out-of-door life, the blue sky and the work that I am engaged in. I think that we as farmers do not realize the blessings of the agricultural life, and that we do not get the enjoyment out of it that we might. We long for those things which we do not have. We have the choicest and richest blessings which the Creator could bestow upon any of his children, and I would give you this thought of being more contented and satisfied with your own life. And then you will have more confidence in your own efforts and powers to take up the work and continue it and make more of a success of it.

I want to refer just now to the case of a young man who became interested in orcharding through my efforts, and who has engaged in orchard work. He is about 37 years of age. He had been engaged in commercial pursuits during his entire business life, but he became interested in orcharding, and he has taken up a tract of forest land upon which he is working now. It is in our neighborhood. The point to which I want to call your attention is the amount of enjoyment that young man gets from his work. He says he can hardly wait for morning to come to get to the woods and begin on his work. He looks like a different man from what he was when in the city, mentally, as well as physically. His work now is being done largely under my direction, but in a few years he will learn the business, because he has such an intense interest in it and loves to do it. He has all the essentials that make for success, and in a few years he will have a fine orchard.

This view is a section which is called Apple Valley. It is a hamlet that is known through the state of Massachusetts, and is often referred to when the possibilities of apples are considered. This valley is occupied by four or five farms, upon which for a number of years, the principal crop has been apples. And here in this valley, surrounded by hills, taking simply the naked

trees which they have had in their pastures and in their mowing lots, and grafting them, they have made the apple a source of large profit. And from this little valley has been taken, almost every year, from six to twelve and as high as fifteen thousand dollars worth of apples. The reason for their success is not that this section is better located, or has better soil, or anything of the kind, than many other sections; but it has been primarily that these farmers have understood the fundamentals that underlie the successful growing of apples. "Better fruit" has been in their minds. Their ideals have been high, and they have worked continually to improve their crop. They have adopted all the modern and scientific methods possible in growing their fruit, and the result is that they have a product that finds a ready sale. It is also a section where they have followed the plan of co-operation, that is, selling their entire crop as if they were one individual. They have given an object lesson to people of our state, and their work may be an object lesson even to the farmers of Maine, that wherever there is a community engaged in the same kind of work, they may co-operate in all their work and efforts, and particularly in the selling of their product.

I will complete this lecture by giving you a cordial invitation, if you come to the western section of Massachusetts, to visit our orchards at any time or season of the year. It is a delight for me to have visitors come from your state for the distinct and special purpose of visiting the orchard.

#### DISCUSSION.

Ques. What do you use for fertilizer on all those trees?

Ans. Our basis has always been stable fertilizer, supplemented by wood ashes. At our experiment station at Amherst they have conducted experiments along that line, and the result is, putting it briefly, that stable fertilizer gives the best growth to the tree, and that wood ashes gives the best color to the fruit, and fruit that matures the earliest. Now I have combined those two elements, and worked for both of those points, to get a healthy, vigorous condition of the trees and also to get a fruit of high color and of fine quality and early maturity.

Ques. How do you keep up the fertility of the balance of your farm?

Ans. By a quick rotation of crops.

Ques. What is your rotation?

Ans. Corn, potatoes, grass and early vegetables.

Ques. What do you use for grass?

Ans. A large proportion of clover. Perhaps half clover and half timothy.

Ques. At what season would you prune your trees if you could do it just at the proper time?

Ans. I would prune all trees in the late portion of winter or the early part of the spring. I don't believe in summer pruning. There may be conditions and circumstances whereby it would be justified, but I believe as a rule that in summer, pruning is debilitating to a tree; and you all know that the average New England tree hasn't got that amount of vigor that it can lose any of it.

Ques. On some of those slides of the orchards in blossom I noticed that the ground apparently hadn't been plowed. Was that a year when you did not plow?

Ans. Those were taken in a year when the plowing had been omitted. From now on, every portion of the bearing orchards will receive cultivation every year, and just the amount of fertilizer that the trees need to keep them in good condition and in good health and vigor, and that will enable them to produce fruit of the highest degree of quality and appearance.

Ques. About how much ashes do you put to the tree, and how near?

Ans. I put neither ashes nor fertilizer very close to the stem of the tree, except when it is small. After the tree has become established, the rule would be to put it around the extremities of the branches.

Ques. Not nearer than seven or eight feet?

Ans. No. Of course it depends upon the size of the tree. With the larger trees, such as you have seen here, I would put it between the extremities of the branches on one side and the extremities of the branches on the other side. The root system becomes extended when the roots fill the soil, and they can take all the plant food that is necessary.

Ques. About how much do you put to a tree?

Ans. A bushel of wood ashes would be the rule, or thirty or forty bushels to the acre, and perhaps four to six cords of fertilizer.

Ques. Do you apply that same amount every year right along?

Ans. No, I would apply that according to the needs of the trees. For instance your trees are bearing heavily this year I would put on a larger application after they have been bearing heavily than if they haven't been bearing, because they have been exhausting themselves. We little realize how exhausting it is for a tree to bear five, ten, or more barrels of apples. It has been figured out how much of fertilizing elements such a crop takes out of the soil. I can't give the figures, but at least we know that we have got to put something back in order to maintain the health and vigor that we desire.

## SOME ESSENTIALS FOR SUCCESSFUL CO-OPERATION AMONG MAINE FRUIT GROWERS.

By WILLIAM D. HURD, Amherst, Mass.

In accepting the invitation of the officers of this Association to speak on the subject of Coöperation, I did so with a full realization that this is no new subject in this State. I am fully aware that this subject has been talked here until many consider it worn threadbare; that several prominent people have worked unceasingly during recent years to establish coöperative enterprises; that there are a few stores, or other small enterprises, being successfully carried on; and yet, so far as I know, nothing has been developed which begins to reach the hopes and expectations of the most earnest workers in this cause.

Watching, as I have for more than six years, the efforts to establish coöperative enterprises in Maine, it has seemed to me that the work was being attempted in many cases without due regard to the first essentials necessary to the success of the movement, so it is to some of these that I desire to call your attention in this paper.

Coöperation is desirable because public welfare demands and profits by it. In talking coöperation one must almost "preach a sermon," for coöperation presupposes a condition of society approaching the ideal. Coöperation is the banding together of the stronger with the weaker for the mutual benefit of both.



More than financial gain must be considered, although we will have to admit that the financial side is the incentive for the organization of most business enterprises.

Coöperation in action does not appeal to the average New Englander because it is necessary for him to give up a great deal of his independence if the project is to prosper. I shall have occasion to speak about some specific examples of this later.

There is every good reason for coöperation among farmers. All other lines of business are organized except our own class; and it is time for the farmers of this country to realize fully that great movements in the industrial world today are not set in motion and maintained by individuals, but by men who have the power and ability to organize and coöperate.

Think about this fact too. We are told that sixty per cent of the price paid by the consumer for the products necessary in our daily living goes to the middleman and dealer, and only forty per cent to the farmer,—the producer. Look at any of the gigantic enterprises we call trusts,—the United States Steel Trust, The Beef Trust, Grain Dealers' Association, the railroad combines, and others known to you. They are nothing more nor less than coöperative enterprises, made up, in these cases, only of the few, and organized for the sole purpose of controlling and amassing large fortunes and driving out all competitors.

Opposed to this close combination is true coöperation,—the kind which we are considering today,—the kind that welcomes and does not stifle honest competition, and seeks to obtain for the man who produces a commodity a just proportion of the price that article brings in the markets of the world.

A common saying, and one admitted to be true by many farmers, is that farmers will not hold together. If the farmers of Maine, or any other state, would combine in a legal manner, their financial strength would be far greater than any corporate interests now arrayed against them. I have often felt that right here in this State with your four hundred and twenty-five or more subordinate granges, eighteen or twenty Pomonas, and a State Grange officered by men of the highest intelligence and integrity, you already have all the machinery necessary for the most successful kind of coöperation, if the organization were



only used for such purposes. But since the organization has not and does not lend itself readily to enterprises of this nature on a large scale, some other method will have to be devised. I am not going to say that coöperation is the easiest thing in the world. Neither will I place it in the category of desirable things yet impossible, for there are thousands of successful coöperative enterprises in this country, and if you are ready to approach this in the right way, and to submit to some of the essentials which successful coöperative organizations have found it necessary to impose on their members, you will have plenty of examples to profit by, and it is reasonable to suppose that success will crown your efforts.

Foreign countries have led the way in coöperative movements for years. The Orange Judd Farmer is authority for the following facts and figures: "More than 1000 coöperative societies for the purchase of fertilizers, implements, fuel, stock, feed, etc., are in operation in Germany. There are about 1600 associations organized for the sale of farm produce; this country also has 1682 coöperative dairy associations.

In France the coöperative societies control the markets for many agricultural commodities.

The little country of Belgium several years ago had 776 agricultural leagues with a membership of 42,000. There were 780 societies for coöperative purchasing, and coöperative dairies increased from 69 to 427 in ten years.

Holland has many agricultural unions. Forty thousand Dutch farmers supply milk to coöperative creameries.

The membership of coöperative dairies in Denmark numbers 148,000. Seventy-five per cent of all the cows in Denmark contribute their product to these coöperative associations. This country also operates twenty-seven coöperative bacon factories.

Sweden has 430 coöperative creameries; Norway 430; and Siberia 2035."

Great Britain is the home of the coöperative idea. The famous Rochdale movement, formed by twenty-eight mill workers to purchase the necessities of life, and after which many of the movements in our own country have been patterned, has a membership numbering millions, and they enter every field of commercial work with their coöperative plans. At the last

annual meeting of the coöperative societies of Great Britain the records showed that during 1908 business amounting to five hundred and thirty-seven million dollars was transacted.

In America four lines of agriculture have lent themselves to successful coöperative enterprises, namely, market gardening, grain growing, the manufacture and marketing of dairy products, and the production and marketing of fruit. The first three are not to be considered in this paper except as the successful organization of them may serve as an example to fruit growers.

The grain growers' association now numbers its smaller coöperative enterprises by the hundreds in the middle West. The battle against the united grain dealers was a hard one. Every device known to crafty traders was used to thwart the efforts of the farmer to organize. Building sites were refused for elevators; switches would not be put in; cars would not be furnished by the railroads; loaded cars were side tracked and demurrage sufficient to eat up any possible profits was charged; the press was used freely to predict and advertise failure; they boycotted for a time commission houses that received coöperative association goods; the local merchants were threatened with department stores; but neither discouraged nor daunted by the efforts of the organized grain dealers, backed by the railroads, the farmers of the middle West have more than sixteen hundred independent elevators, owned by more than three hundred thousand stockholders.

Mr. N. O. Nelson visited fifty-five of these coöperative elevators and stores in Minnesota, delivering an address on coöperation at each place. Writing in a recent number of the Outlook, he says:

"We explained the economic, social and moral value of coöperation. We reminded them that their splendid homes and barns had been built by the coöperative creamery. We laid stress upon the value of coöperation as removing an ever present tendency to greed and fraud in private profit sharing business. We showed them that 'by the people and for the people' is even more important in trade than in government. We pointed out the influence of coöperation on religion in contrast with the adverse influence of private trade. We showed them that the coöperative creamery, elevator, mill, packing house, or store, lead up to consolidated schools, central high schools, better roads, town halls for social and public uses, young people

saved from going to cities, the intelligence, social and religious life of the community steadily rising, and we asked them if this is not a natural outgrowth and reasonable prophecy of coöperating in all lines of business affairs."

Instances are numerous in these associations where, at an expense of four thousand dollars for salaries, and on a capital of less than twenty-five thousand dollars, a yearly business of more than six hundred thousand has been carried on. From one-half cent to four cents per bushel beyond the regular market price has been paid for grain, and in addition the coöperators have realized approximately thirty-three per cent on the paid up capital. I speak of this coöperation in grain dealing at this length simply to call to your attention the great success attained by one class of farmers, and the possibilities open in other lines.

The banding together of the fruit growers of Maine, or of any section of this State, for the organizing of this great industry in a coöperative way, is a larger problem than simply organizing for the sale of fruit. The enterprise should also include coöperation in production, which involves many other factors. This brings us to the essentials to be considered in the organization.

It seems to me that one of the first things to be realized is that a sufficient amount of fruit must be raised to make the region of enough importance to draw buyers. When a sufficient volume of business can be guaranteed, not only are buyers attracted, but transportation companies are usually quick to make concessions in order to get business.

Another lesson brought home to every one from the New England Fruit Show was that the fruit must be of a high quality, and uniform, in order to compete with that from the Pacific coast. When New England fruit possesses these two characteristics, it can compete with, and will drive the western fruit from our own markets.

Coöperation in buying supplies is another important thing. One small association in the Hood River region saved its members twelve hundred dollars on spraying material, one thousand dollars on wrapping paper, three thousand dollars on crates, and four thousand dollars on boxes, in one year. To this list might be added in Maine, the fertilizers ordinarily purchased. An association in Maine should expect to build coöperation establishments for the manufacture of barrels and boxes.

The passing of laws by the last legislature regulating the packing of fruit, and the desire on the part of many to market their fruit in a better way, will be a stumbling block to many for some time to come. The coöperative association could either pack the fruit, or engage someone to go about giving instruction in the packing and grading. Here is a good chance for Maine fruit growers to take a lesson from the cow testing associations that have been organized so successfully by Commissioner of Agriculture Gilman and Doctor Leon S. Merrill. This is coöperative work of the highest order. The same kind of work is possible in fruit growing.

An orchard survey of the fruit growing counties of this State would be of great value. Not only could an estimate be made of the extent of the orchards, the varieties, etc., but an accurate account of the methods practiced could be obtained, and, wherever necessary, advice which would lead to the production of a higher grade product could be given. High grade products are one of the unalterable demands of coöperative marketing. In short, why not coöperate and hire a traveling fruit growing instructor just the same as the dairymen have traveling dairy instructors. Some railroads already employ just such men to go up and down their lines giving instruction to farmers. They find it pays them in extra volume of freight.

Coming to coöperative marketing, there are the railroads to be considered. No man, railroad man or other, has been able to explain how railway rates are made. Why a rate from the Pacific Coast to Omaha should be the same as a rate from the coast to Boston or New York, and why the railroads in this State should attempt to charge twice as much on a car of fertilizer between Portland and Bangor as between Boston and Bangor, is unexplainable. But successful coöperative enterprises, with a sufficient volume of business, can bring the railroads to time. Coöperative advertising enters into the marketing problem too. Individuals cannot afford to advertise extensively. One of the largest fruit growers' associations of California has a committee on advertising, which is spending fifty thousand dollars this year where twenty-five thousand dollars was spent last, against five thousand dollars two years ago. This advertising in Sioux City alone doubled the consumption of California fruit consumed there last year. Why should not Maine fruit be advertised?



A good coöperative system would direct your fruit to the best markets. One of the principal objects of the "American Fruit Growers' Union" is to divert and distribute the supply so that markets are neither glutted nor without the products. Any one who has had much to do with markets knows that at times carload after carload of good fruit may come into a certain market on a given day, with the result that the fruit cannot be sold at any price, while perhaps only a few hundred miles away another good market is entirely barren of that product. A good selling agent in the employ of a coöperative concern could watch the movements of fruit and avoid such conditions.

Cold storage houses, similar to potato houses, built along the lines of the railroads, fruit evaporators, and vinegar or canning factories for the utilization of what would otherwise be waste products, are also within the range to be covered by coöperative fruit growing associations. It seems to me that these should be considered seriously by Maine fruit growers. An instance came to my attention a few years ago when seven thousand dollars was paid to the growers of small fruits in one locality where the crop would have been a total loss had it not been for the fact that a couple of canning factories could use the product.

But, you say, all of these things require money, and this brings us to what is perhaps the most important essential in successful coöperation,—the necessity of a thorough going business organization. Failure in the past in nine hundred and ninety-nine cases out of a thousand has been due to poor business organization and management. If you expect to get something for nothing, you better not go into a coöperative business enterprise.

Many farmers of my own acquaintance in this State, while believing in the coöperative idea, have refused to take even a single share of stock. A successful coöperative enterprise must be founded on the same laws of business as though a personal business venture was being started. It is perhaps even harder to start a coöperative enterprise than a personal one, for in the one case one man with one mind is the directing force; and in the other, a dozen, or perhaps several hundred persons with widely varying ideas, all have their hand in organization and management. The coöperative enterprise must, like others, be governed by statute law. The foundation stone of coöperative



enterprises is confidence. It is important, then, that men of the highest integrity and unquestioned honesty should be at the head of the association. Managers and directors will be suspected of graft sooner or later. They will have plenty of opportunity to receive private commissions on purchases or brokerage on sales. They must be strong enough to withstand such temptation when it is presented to them. There are always many people to become jealous of the prominence which the managers and directors must necessarily have. A common mistake made in farmers' organizations too, is to expect to secure a manager for thirty, forty, or fifty dollars a month, who is capable of handling twenty-five, fifty, or a hundred thousand dollars worth of business in a year and paying good dividends. Men capable of doing this can earn at least five to ten thousand dollars a year from private enterprises. A successful coöperative enterprise cannot be expected to succeed unless it has at its head a man of experience, tact, and ability, who understands markets, buying and selling, and is a master of the business. Sentiment has no place in coöperation. Because a certain man owns stock, is influential in the community, and has a son who needs a job, is no reason why he should be given an important place at the head of the concern. There will always be scheming for places of advantage in coöperative enterprises the same as there is in politics or business, but all this must be "cut out."

A successful coöperative enterprise must, first of all, have capital. This is often not taken into serious consideration. Enough capital must be available to give stability to the organization and not cripple its opportunity for purchase and sale. Coöperative enterprises must keep out of debt. They must do a cash business, and must keep their rating and business standing first class.

The farmers or coöperators themselves are usually responsible for the failure of their own enterprises. The stockholders are often guilty of such neglect as would down any business in a few months. After a manager and board of directors are elected, the stockholders seem to think that it is their especial privilege to stand off and find fault with the management, rather than to consider the project as a thing of which they are a part. They grow suspicious and jealous, ruptures are caused which keen men in other lines of organized business are quick to detect and take advantage of. No coöperative enterprise can flourish

unless it has the hearty support of its own stockholders. While I was living at Orono a coöperative grange store was organized in Bangor. It has had a more or less prosperous existence. The retail dealers of that city have succeeded in underselling the coöperative store in many ways. Instead of sticking by the coöperative store, and seeing it through its early struggles, men of my acquaintance and stockholders too, have deserted their store for the time being and have given their trade to the retail man, who was really working against their own interests, in order to save a very few pennies. Such tactics on the part of the grain growers of the West or the fruit men of California, Colorado, or Oregon, would have killed, in the first year, those organizations which we now look to as models of their kind.

Now, as I have said before, if you are ready to accept and stand by some of these fundamental principles which I have mentioned, you can without much trouble organize in Maine just as successful coöperative enterprises as can be found anywhere on this continent.

California perhaps leads in the success of their fruit packing and shipping associations. Oregon, especially the Hood River region, ranks equally well. The Grand Junction Fruit Growers' Association in Colorado shows remarkable growth. It began business in 1897 with six hundred and sixty-six stockholders, shipped one hundred and sixty-seven cars, and did eighty-eight thousand nine hundred and thirty-seven dollars worth of business. Ten years later, January, 1907, this association had fourteen thousand one hundred and sixty-nine shares of stock, shipped one thousand and thirty-six cars, and the volume of business aggregated eight hundred and fourteen thousand two hundred and seventy-eight dollars. Georgia and Maryland have organized successfully. All of these associations publish lengthy documents of instruction and rules for governing the work of the packers. For detailed information of the work in these states, I would refer you to Bulletin 94, Oregon Experiment Station; Bulletin 122, Colorado Station; Bulletin 18, of the Dairy and Cold Storage Div., Dept. of Agriculture at Ottawa; Bulletin 116, of the Maryland Station; and for the latest record of progress made along the lines of coöperation, to the American Coöperative Journal, a monthly publication printed in Chicago.

The Wathena Fruit Growers' Association of Missouri has

been a most successful coöperative enterprise. The following statements have been taken from an article appearing in "The Fruit Grower," published at St. Joseph, Missouri.

"Early in 1905 a few of the growers met and debated that the thing to do was to organize a shipping association and handle their own fruit and buy their own supplies. As a result the Wathena Fruit Growers' Association was organized, and the first year the new organization had but twelve members. The firms which had previously handled the fruit of the growers claimed that the new association could not last; that farmers could not market their fruit to advantage, and all sorts of hindrances were put in the way of the association, in the form of extremely low prices for fruit packages, and unwarranted high prices for fruit at critical times,—this being done to discourage the members of the association, and to entice them away from their organization.

The first year the organization did fairly well, but the members gained much in experience. This year, the second season of its existence, the association has made a splendid record. The organization has 100 members.

The association has bought all the material needed by its members, effecting a considerable saving. For instance, growers near St. Joseph paid 6 and 7 cents apiece for one-third bushel baskets in which to ship peaches; members of the association at Wathena paid 5 cents for the same packages.

At the beginning of the season every member signs a contract to market his fruit through the association; if the St. Joseph market offers a better price, he must receive the consent of the manager before he can take his fruit across the river. This consent, however, is not withheld unless the association needs the fruit to finish filling a car which has been sold.

The association sells practically all its fruit on track, although it sometimes happens that small quantities left after filling cars are consigned to reliable firms. After the manager knows the price to be received for a car of fruit, he makes the 'platform price' to the grower accordingly. This platform price is usually about 25 cents a crate less than the price the association receives. Suppose a carload of strawberries has been sold at \$1.50 a crate, and every grower who delivers fruit which passes inspection receives a ticket entitling him to \$1.25 a crate, which can be collected by him when he chooses. The next day a car

may be loaded at \$1.75 a crate; then the platform price is \$1.50, and the growers receive credit for the fruit delivered at that price per crate.

When the strawberry season is over the expenses of the association in handling the crop are deducted from the 25 cents profit retained on each crate, and the remaining sum is apportioned to the growers who furnish strawberries, according to the original sums they received as the platform price.

This same plan has been followed through all the season.

The members of the association are much encouraged, and have seen the necessity of maintaining their organization. Greater quantities of fruit have been shipped from Wathena than ever before in a single season, and at a time when all the neighboring country has good fruit crops. Notwithstanding the large fruit crops, however, the prices received by the growers have been better than for many years, and instead of feeling discouraged, the members are planting increased acreages to fruits. Their organization has made the business profitable, when without it they were considering giving up the business.

The association guarantees its fruit. All fruit is inspected when delivered, and after that time the organization stands behind the guarantee. In order to maintain a good reputation for its fruit, the members are urged to plant varieties which will carry a market in good order.

The growers in almost any community can organize along the lines of the Wathena Association. Get a few of the leading growers to start the association; the first year discouragements will be met, but if the organization is properly managed, the next year things will come easier.

'One thing which cannot be too carefully guarded in an organization of this kind,' said the manager, 'is the reputation of the fruit sent out. Every grower must realize that he is a part of a mutual organization, and he must see to it that he does nothing which will injure the reputation of the association or his fruit. Each member is on his honor to pack nothing but good fruit, and it is to the credit of the members that they have established a high reputation for their fruit and their methods.' "

Our New England conditions are so similar to those of Ontario and the other provinces of eastern Canada that it is worth while to consider some of the forms of organization and the



regulations of the Canadian fruit growers' associations. From a bulletin issued by the office of the Dairy and Cold Storage Commissions of Ottawa, I learn that there are twenty-five co-operative associations in Ontario, and nine in British Columbia. It might be interesting to you if I quoted some of the by-laws regulating the growing and packing of fruit in one of these associations.

"Each and every member of the Association shall pick his fruit in prime condition and deliver same at packing house or shipping point.

An inspector or manager of the Association shall be appointed by the Directors to supervise the work of grading and packing the fruit of the Association, the salary of the said inspector to be determined at the time of appointment.

The manager shall give personal instructions in their orchards to all the shippers shipping through the Association how to grade and mark their fruit according to the Fruit Marks Act.

He shall also inspect a certain number of each shipper's barrels in each car and immediately before shipment in order to ascertain if the Fruit Marks Act has been carried out, and if he finds that any shipper has intentionally disobeyed the Fruit Marks Act he shall be refused acceptance of fruit and held responsible for space in car.

If the inspector disagrees with shippers regarding grade apples, for the settlement of such disagreement he shall choose one director, the shipper one director, and both jointly any disinterested person, who shall decide, basing their decision on the Fruit Marks Act.

Each and every member shall have the right to give away such fruit of his own raising as he may elect, but he shall not make sale of fruit outside the Association except windfalls and cull grades or any fruit that may not be accepted by the Association. Any member so doing shall pay into the Association treasury the sum of 50 cents per barrel for all fruit so sold excepting grades aforesaid.

Whenever in the opinion of the directors it is impossible for the Association to receive at its packing house all fruit grown by its members, they may permit individual members to grade and pack the same for shipment through the Association, such grading and packing to be subject to the inspection of the inspector appointed by the Association.



All members of the Association shall spray their orchards at least four times, and as often beyond that as they deem proper.

No fruit grower shall be admitted as a member of the Association except by a two-thirds vote of the directors."

It will be noticed that all members are bound to ship their fruit through the Association. In some associations those violating this agreement are compelled to pay a penalty on every box, bushel, or barrel sold outside. Notice should be taken, too, of the right of the association to reject any unsatisfactory fruit. The association also must be in position to guarantee a certain amount of fruit and of a certain quality. The reasons for this are obvious. It is because of some of these regulations that I said earlier in this paper that the coöperative idea in actual working went against the "grain" of the New Englander.

Through these organizations, members of the associations have been able to receive \$2.25 a barrel for their fruit, while many growers outside only obtained a dollar, and some not more than fifty cents.

Other advantages of coöperation over the ordinary way, are obtained by the Canadian grower as follows:

"It is proposed to substitute for the ordinary methods coöperation in packing as well as selling, and incidentally in any other phase of apple growing that will lend itself readily to this mode of operation. The following advantages will be gained by the adoption of coöperation:

(1) Large stocks will be controlled by sellers who will act as a unit.

(2) Uniform packing, grading and marking will be practiced.

(3) A reputation associated with a permanent brand or trade mark will be established.

(4) The cost of picking, packing, and marketing will be reduced.

(5) Fruit will be picked and packed at the proper time.

(6) Less common varieties will be utilized.

(7) Storing facilities will be better provided for.

(8) Direct selling at the point of production will be encouraged.

(9) Packages will be bought in large quantities or manufactured on the premises with a material reduction in cost.

(10) The placing of the purely commercial part of the industry in the hands of competent men whose interests are connected with those of other members of the association.

(11) Spraying by power outfit, co-operatively, will in most cases be adopted.

(12) The manager and the better growers among the patrons will have every inducement to stimulate the less progressive members to better work."

I have tried to present to you in this paper some of the essentials necessary to the business success of coöperative enterprises. I hope I have not said discouraging things, but feel strongly the need of a careful consideration of these before you take any plunge which may mean much to you individually, and to the fruit interests of the state. There is an old Italian proverb which reads: "Those who go slowly go far." I feel that this is good advice to follow in the organization of a coöperative fruit growing and marketing association.

The preface to Bulletin 18, of the Ottawa Department of Agriculture, contains the following statement: "The true spirit of coöperation must be recognized and accepted by those who propose to embark in the enterprise. The mere form of coöperation will not be sufficient."

The spirit of the movement is evidently upon us. Coöperative organizations are on every hand. The tendency everywhere is to form societies which shall secure for the man who produces, a just share of the profits from his labor. The "new farmer" must be a business man and not a waster of resources given to him to handle and develop and to do this he must join forces with man and nature. Study coöperation, analyze every phase of the movement, compare the different plans now in operation before you begin, and then go ahead and perfect an organization which shall be of such far reaching results and of such lasting good to the community that anything yet started in this State will not begin to compare with it.

MR. MERRILL: Mr. President. I have been interested in coöperation for a good many years. What Prof. Hurd had to say has simply confirmed me in the opinion that has been growing upon me for years past. I would like to have some man assign to me a good reason why men whose interests are identical should not act together. It is a policy that has formed combinations of great business interests, but it is difficult to

adapt to all conditions in country life, where there are so many men engaged in so many different operations. For instance, in this state there are 60,000 farms, and you can well see the difficulty in bringing about coöperation between all these people. Yet in different neighborhoods, where it could be compact in its operation, there is every reason why we should coöperate. As I think of the fruit business, I have come to believe that coöperation could be applied to that business very readily and profitably.

We are applying it in our dairy business, through organized effort in cow testing work and in the Coöperative Breeders' Association work. We have five of each of those kinds of association in this state at the present time.

Another work which to my mind is more important and far reaching, so far as its financial interests are concerned, we are about to take up, and that is the work of seed improvement through organized effort. The legislature at its recent session passed an act directing the commissioner of agriculture to undertake this work, and made an appropriation to carry it on. I am quite safe in saying that all the agricultural interests of the state will coöperate in the work. I have been assured of the assistance of the experiment station, and of the bureau of farm management at Washington, and I am equally positive that the agricultural college will do anything in their power to aid in this work.

I have been over the work that has been done by the different states, and to my mind that work which most closely unites the experimental and the practical business world of coöperative effort is the one most likely to succeed. I think all experimental work that is done by farmers, and I am not sure but I might equally say by the experiment station, so far as its immediate benefit to the great mass of agricultural people is concerned, should always be done with the commercial end of the proposition as a basis. Sometimes I feel we disregard this.

But let us come down to the possibilities of fruit growing for a moment. I am not a fruit grower, but there is something besides the dollars and cents to this question. There is a matter of education that comes into all associated work. And wherever you find associated work, there you find increased interest, better conditions and a better understanding of the business. To my mind one of the greatest advantages coming

from an organized fruit growers' association will be through the educational benefit the members derive from the work, independently of the financial benefit. It is the happy combination of the two that will enlist and hold the interest and support of our people.

I think, Mr. President, the Pomological Society should take an active part in the organization of a fruit growers' association in this state. And right in here, I believe that the Department of Agriculture should and will, with sufficient funds at their disposal, give you just the man that Prof. Hurd outlined, a fruit growers' instructor, who should travel from community to community in our state and assist the people who are growing fruit.

This idea of governmental assistance is growing everywhere, and wherever it is practiced most, there we get the greatest benefit from it. For instance, just across the line in Canada, during the past summer, and during every summer for years, there are many dairy inspectors traveling from cheese factory and creamery to cheese factory and creamery, until uniform methods are adopted, and you can hardly tell the product of one factory from that of another. The same thing holds true in other rural countries. I thank you very kindly for the invitation to say a word on coöperation.

## ORCHARD TILLAGE.

By V. R. GARDNER, Prof. of Horticulture, Orono, Me.

Some of us may be in the fruit business because our fathers were before us, some of us may be in it because we like the kind of work, some because of our health—we've got to be out in the open—but most of us are raising fruit because of the money there is in it. Our first object is to make it pay—and not only pay but pay well. For us it is not the system of management that with the least amount of labor will make the account just balance, but the system that will give the greatest possible *net returns* that we want. If we can invest \$5 per acre per year in care and attention and get \$10 in return, it is a good investment; if we can invest \$25 per acre per year and get back \$100 it is a better investment. In the first case there is just



\$5 net profit; in the second there is \$75. It costs money to plow and cultivate and till an orchard. Is it a paying investment? The object of this paper is to point out what tillage costs and what it brings back.

There are at least two ways of determining the value of any proposal that involves the outlay of any money. One is to reason out the matter as best we can; the other is to actually try it.

Suppose we first reason out this question of orchard tillage in the light of what modern science and agriculture have taught us about the cultivation of the soil. In the first place cultivation loosens up the top 3 or 4 inches of soil and largely prevents the escape of the moisture beneath. This moisture is needed for the growth of the trees and their fruit. The amount of tree growth and the relative size of the fruit are almost directly dependent upon moisture supply. When trees are in sod the grass roots remove large quantities of this water from the soil and evaporate it through their leaves. This robs the trees of their rightful supply and seriously checks the development of their fruit.

The excellence of western fruit is a matter of common knowledge. It sells because of its color, freedom from blemishes, uniform large size, and the way in which it is packed. It is often imagined that its size is in most cases due to irrigation. In some sections it is true that irrigation is practiced; yet in some of the best regions where irrigation is available and there is a moderate rainfall, irrigation is not practiced, continuous cultivation being preferred.

Cultivation not only conserves moisture but it sets free plant food in the soil. When the soil is stirred it is aerated and the bacteria and other organisms have a much better chance to multiply and act upon insoluble plant food and make it soluble. I do not mean to say that cultivation will entirely take the place of fertilizers for many of our orchard soils are deficient, but there is much unlocked, unavailable food in nearly all of them. Cultivation is the key which unlocks it. What little plant food becomes available in sod covered land is largely absorbed by the grass roots and the tree gets only a small proportion.

Not only does sod in the orchard rob the fruit tree of its food supply and its water but recent investigations tend to show that grass roots secrete substances which are actually poisonous to tree growth.



So much for the theoretical side. How does cultivation work out in practice? I can do no better than call your attention to a chart showing the results of cultivation in a New York orchard.\*

The orchard in question is located in Monroe County. It consists of nine and one-half acres of trees 32 years old. In the spring of 1904 this orchard was divided into two equal parts by a line run through the middle. One-half was plowed and cultivated. In the other half the grass was allowed to grow and was later cut and left as a mulch. This afforded much better conditions for the trees than the method commonly practiced of cutting the grass and hauling it off, for what was removed from the soil during the summer was returned in the fall. This treatment was kept up in the two halves of the orchard for six years with these results:

	Sod	Cultivation	Difference
Average yield per acre	73 bbl.	109 bbl.	36 bbl.
Cost of maintenance	\$18.00	\$24.50	\$6.50
Income at \$1 per bbl.	73.00	109.00	36.00
Net profit	55.00	84.50	29.50
Income at \$3 per bbl.	219.00	327.00	108.00
Net profit	201.00	302.50	101.50

The average cost of maintenance per acre in the uncultivated part was about \$18 per season. In the cultivated area it was about \$24.50 per season. It cost just \$6.50 per acre per year to plow and harrow and till and sow cover crops in the one part of the orchard. The average yield per acre per year from the part in sod was 72.9 barrels, from the part that was cultivated 109.2. The average difference per acre per year in favor of cultivation was 36.3 barrels. At \$1 per barrel the orchard in sod would bring back a return of \$73 per acre, giving a difference in favor of tillage of \$36. In other words at that price an investment of \$6 an acre was made each year and 5 months later \$36 was returned. I ask you, does it pay? \$1 per barrel is a very low price for apples, however. Suppose they averaged \$3 per barrel. The cost of cultivation would be the same, the net return from cultivation 3 times as large or \$108 per acre per year. Again I ask you, does it pay? How

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\*Hedrick: Bul. 314, N. Y. Agr. Exp. Sta.

about some other characters of tree and fruit in these two halves of the same orchard? The fruit from the sod land ran 434 apples to the barrel, that from the tilled ground 309. Our markets today are demanding larger fruit. It is juicier and better. Oregon growers who pack only in boxes say that the demand for  $3\frac{1}{2}$  and 4 tier apples is increasing. Consumers want it in place of  $4\frac{1}{2}$  and 5 tier fruit. When we grow fruit for the market we have got to reckon with the consumer. In common storage fruit from the cultivated orchard kept 4 weeks longer than that from sod land. Here where our best prices come late in the season 4 weeks difference in keeping quality counts for a great deal. Fruit from the trees in sod was more highly colored than that from tilled land. The average gain in diameter of the trunk during the 5 years the trees were in sod was 1.1 inches; of the trees in cultivated soil 2.1 inches. The average annual growth of branches for the sodded trees was less than 2 inches, of the tilled trees 4. The leaves of the tilled trees came out several days earlier and remained on nearly two weeks longer than those on the others. They were larger and of better color indicating better health. The roots of the sodded trees were nearer the surface where they are more subject to drouth and winter killing.

"But," you say, "this is only one New York orchard. Is what is true about tillage and sod in this instance true generally?" The answer is "Yes;" and at this point I can do no better than call your attention to a set of figures presented at our Pomological Society meeting last year by Professor Craig.\*

Yield in bushels per acre—a 5-year average.

		Orleans Co.	Niagara Co.
		Yield	Yield
Tilled	10 yrs.	327	280
"	5 "	274	254
"	3 "	225	239
Sod	3 "	222	209
"	5 "	204	197
"	10 "	176	194

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\*Rept. Me. Pom. Soc., 1908-9, P. 96.

This chart shows the average yields per acre per year for 5 years back of orchards that have been in sod and those that have been cultivated for various periods of time. The average in each case is the average for the whole county. Those of you who are acquainted with the fruit industry of New York will recognize two of the largest fruit producing counties of that state. In Niagara county the average yield per acre in those orchards that have been in sod for at least 10 years was 194 bushels; in sod 5 years or more 197; in sod at least 3 years 209; on the other hand the yield in those orchards that have been cultivated at least 3 years was 239; cultivated 5 years or more 254; and cultivated 10 years or more 280. In Orleans County the difference in yield was much the same, being 176, 204, 222, 225, 274, and 327 bushels respectively under 10, 5, and 3 years of sod, and 3, 5, and 10 years of cultivation.

These results are especially significant because they are the results of experience, not experiment,—the experience of the fruit growers of two large fruit producing counties. Note that these “experience” figures seem to show that the beneficial effects of cultivation in the orchard are cumulative and that the injurious effects of sod are likewise cumulative. In these counties experience would seem to demonstrate that it is profitable to invest \$6 in cultivation and get back the value of 86 bushels of fruit (the difference between 194 and 280) in the one case and 151 (the difference between 176 and 327) in the other. Again I ask, does cultivation pay?

Within the last few years several widely separated regions in the United States have become famous for the production of fine fruit. For apples probably no region has become more famed than Hood River, Rogue River, and Yakima Valley. I have the figures showing the status of orchard cultivation in only one of these districts—Rogue River.\* In Jackson County where that is located there are nearly 10,000 acres of orchard. Over 98% of this area receives some cultivation and 70% receives good cultivation. Only a little over 1½% of the area is totally neglected and that is mainly in the small home orchards where no fruit is raised for the market. Other factors have

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\*Lewis: Bul. 101., Ore. Exp. Sta., P. 53.

contributed to make Rogue River Valley apples sought after by the big markets of the country, but I submit that cultivation is an important one.

We do not need to go west for evidence that cultivation is needed in the orchard. There is hardly a fruit grower here that would advocate setting trees in sod and leaving them there from the first to take care of themselves. Nearly everyone plows his land and cultivates about the trees for the first couple of years to get them started. They know that they will grow much better with cultivation than without. But when they get the trees once established cultivation is discontinued, the orchard seeded down and after that the trees must struggle along with grass for a scanty supply of food and moisture. Here and there in this state is one who believes in orchard cultivation and believes in it firmly enough to practice it. What are the results? I am sorry that I cannot present the evidence of each one who has been practicing it. This past season has been characterized by a light fruit crop all over the state. People say that it has been an "off" fruit year. Yet I have seen a few orchards with very nearly full crops of fruit. In each case these have been cultivated orchards. Ask these men what they think of cultivation as a practice, not as a theory, and they one and all heartily favor it. One grower expressed it in this way a couple of months ago: "You've got to keep the trees *coming*, the leaves dark and rich and healthy, if you get the fruit."

I do not want to carry the impression that fruit cannot be grown without cultivation. It can and is. Trees standing in sod will produce fruit, not because of the sod, but in spite of it. The struggle which they must make with the grass for food and moisture prevents them from doing anything like their best. Fruit growers cultivate their strawberries, raspberries, currants, gooseberries, plums, peaches, and grapes because they *must*. These fruit plants will be choked out and killed by grass in a few years if left uncultivated. Fruit growers neglect their apple orchard because that fruit is tougher, hardier, stronger than the others and will live along in competition with grass. Give it the same cultivation that is given the tenderer fruits and it will respond as promptly as they.

If there is one implement that is characteristic of modern agriculture it is the cultivator. Gradually we are learning the lesson that our crops are not altogether dependent upon what



nature chooses to give us but largely upon what we direct that her sunshine, her rain, and her soil shall produce; and the 3 tools which we can use to control nature's forces in the orchard are the pruning saw, the cultivator, and the sprayer. I wish to close this talk with words that New England's most famous fruit grower—J. H. Hale—used in an address many years ago. I think he would reiterate them today: "Culture, culture, culture is the sure road to success, while any other scheme of handling the orchard is nearly sure to lead the other way."

MR. WASHBURN: I have been a farmer for a number of years, and I think I have learned one thing thoroughly, and that is that cultivation is the main thing in raising fruit or any other crop.

MR. ROUNDS: I do not usually prune my orchard much, but last spring I went out one morning when there was a good crust and pruned some of my Spy trees and about all the fancy fruit I raised this year grew on those trees. The cultivation was done by hogs. I had an acre or so fenced off where I kept my hogs, and about all the fruit I raised was in this portion of the orchard.

MR. GARDNER: The use of hogs in the orchard reminds me of what I have heard in relation to a country in Africa. There is a country there which is pretty nearly uncivilized. They have no tools for plowing the soil, but when they want to get the soil stirred up a little bit for planting their crops, they turn their hogs loose and they will root it up some. Now our methods of plowing the soil and cultivating it today, with modern implements, are somewhat ahead of the methods used in Africa, and I think that to just the extent that our methods of general cultivation are ahead of the primitive methods of plowing and cultivating, so the use of our best tools in the orchard is ahead of hogs. I do not wish to be understood that hogs are not good, but the use of the plow and cultivation will go ahead of the swine.

MR. LELAND: I wish to emphasize the remarks made by Prof. Gardner in relation to the work done by my neighbor, Mr. Washburn. He has tried cultivation, and good results are to be seen, and those who have been permitted to see his orchard the past summer cannot help seeing that it is a paying investment to cultivate, and as the professor said, the expense of some

six dollars per acre in cultivation has been returned many fold in crops received this year, to say nothing about the benefits which will be received as the years go by.

MR. MORSE: I want to say we have two or three different orchards. Some we cultivate,—plow and harrow just as we do a corn field, and some we do not. And there are hundreds of acres of land in the state that will bear apples just as well if they are fertilized without being cultivated, as they will with cultivation. We have one orchard which we cultivated nine years in succession, and cultivated it well, and we had a nice crop of apples. I could take you to another in this location on one of these old rocky hills, too rocky to cultivate crops, but we fertilized it every year, and if anybody has raised a finer lot of Baldwin's than we have there I would like to see it. And cultivation, the way I understand it, for an orchard, may mean several different things. It may mean plowing and cultivating with a harrow. It may mean fertilizing and taking care of it that way. In my personal experience, apples can be successfully raised both ways.

## THE CRY OF THE ORCHARD.

DR. G. M. TWITCHELL, Auburn.

*Mr. President, Ladies and Gentlemen:*

I never stand before an audience to discuss any of the great questions which are confronting us in farm life and work of today, but I feel the increasing consciousness of my own inability to clearly set forth the lessons which seem to be implied, or present truths which seem to be demanded.

Looking over these tables, loaded as they are with magnificent fruit, coming from Maine orchards, it hardly seems possible that it would be necessary for us to take up and discuss, with any idea of thoroughness, the questions of care and cultivation, of fertilization and treatment, or selection of trees, which have been presented today, or will be presented in the coming sessions of the meeting, yet the great fact faces us that the majority of our orchards today are sadly neglected. Not long ago I heard one of the best authorities in New England say, when speaking

of the industry in New England, that the apple trees grow themselves. How far that may be true, I leave it for you to determine. That it is true to a larger extent than it should be, is a fact we all recognize.

Here is an industry worth to the State of Maine yearly from \$1,500,000 to \$2,000,000. Does that mark the limit? What is it possible for us to do to increase, first of all, the quality of our fruit? That is the question. This, it seems to me, is the problem which confronts us every one. We know that our soil and climate are peculiarly adapted to the growing of the finest quality of fruit grown in all the country. A grower from Seattle said to me, during the late Fruit Show: "We acknowledge the superiority of eastern fruit, and of your New England apples," and then went on to make the claim, of course, that they had us beaten all out in the markets, and could get a price which we couldn't even hope to obtain, simply through their system of packing.

How far is this necessary? Must we accept the situation and admit that while we can grow a superior quality, there are conditions which we cannot control, and that those conditions are a barrier to our progress in the work of today? I don't believe it. So the first cry that comes to me from the orchard is that there be no further increase in trees until we have provided the ways and means by which those now growing be given the opportunity to do their best. It seems to me that here is the first thing for us to do—put ourselves into the study of this question as it confronts us today with reference to the market demands of the day and the conditions which meet us in the markets now. All these things coming to us from different standpoints than they did formerly, force us to consider the question differently from what we did five or ten years ago, and therefore I think make it necessary that we first of all should see what can be done with the trees we now have living and growing upon the farms and in the orchards of the state. When we have so studied the question that we appreciate the situation and feel certain that we are giving those trees the best chance possible to perfect themselves and develop the fruit which we desire, then we can begin to discuss the question of extensive work in orcharding upon a larger scale than has yet been attempted. For it is a fact, given by those who claim to know,

men who are selling the trees, that not one tree in fifty ever comes into bearing. That being so, if we stand by our position that soil and climate are natural here for the development of the highest quality of fruit, we must admit that, following the setting of the trees, there is great neglect in order to explain the situation, stated by those who are disposing of the same.

The next cry from the trees is for a chance to do something. Everywhere, while we are growing a fair quality of fruit, that lesson comes home. It was presented this morning ably by Prof. Gardner, and I want to call attention to his chart, as given there, showing the difference in yield of the trees in sod and those in cultivation, giving us an object lesson, it seems to me, of tremendous force. Yet, you will remember he had hardly finished when one of our best growers defended the sod conditions, and declared he was getting as large a yield and as fine a quality out of sod as Prof. Gardner had claimed possible out of cultivation, indicating, it seems to me, the wide range of study necessary in order that we may solve these conditions, and that the lessons applicable must be studied by the individual grower in order that he may know what is demanded in his own orchard.

The question of pruning and sunlight necessary for the procuring of fruit is one of the most important problems we have to consider. As I have been going about the state the last few years watching the work being done in our orchards, it seems to me we fail to enter into an appreciation of the conditions necessary in order to produce the best results with the tree, and that pruning should be mild and frequent to induce the best life and growth of the tree.

The cry of the orchard is for more food. The trees are hungry, and they should have food for the leaves and the trunk and the branches. Unless our trees, twelve or fifteen years of age, or more, are making a foot or more of wood growth a year, something is wrong in the work we are doing. Are they doing that? It may be, in a number of cases, but there is always that large per cent who fail to do the work they should and supply the food necessary.

Here comes in the question of food supply. I was hoping I might call attention to these rich looking Baldwins as indicating the use of ashes, or of potash indicated by the intense color,



but I couldn't. The owner says that is due to cultivation. But then he did say his Spys obliged him to resort to potash in order to get the color on them. This question of feeding the tree, it seems to me, is one of the great problems confronting us, and we must feed where and when it will give the tree the most food and the best results, where we reach the feeding rootlets of the tree in the rapid growing season.

There are some photographs which I brought on the table, and if you care to look at them they show a bunch of trees which were condemned as worthless two years ago this fall, and where a man was sent to cut them down. I bought the little place a year ago last May and plowed and planted alongside the trees, working up within about eight feet of the trees. This year I applied ten pounds of Fisher's formula fertilizer to those trees. You know that fertilizer is criticized somewhat because of the amount and cost of nitrogen it contains, but for the starting of a neglected tree, I do not know of anything which will give a better wood growth. Those old trees made a wood growth this year of one and a half or two feet, or more, and were covered a few days ago with a very dense, firm foliage. While the other trees around the orchard were dropping their foliage, these leaves held firm up to about the first of November, and I don't know how much longer. That fertilizer is, I think, one of the best agents we can use to start an old orchard, to set it in motion, but I think the caution given us, which you will find in the report of this Pomological Society last year, in the address by Prof. Hurd, where he emphasizes the use of potash and phosphoric acid, and gives the formula which should be used the second year and thereafter on these same trees, should be carefully observed.

Next, is the cry for protection. I wonder how many of us are studying that. How many of us are seeking to get the right sprayer to give the most perfect results? How many are studying sprayer construction and the nozzles to be used and formulas to be applied, and are perfecting ourselves by practice in preparing those agents, the insecticides and fungicides, so we can go out and do that thorough work that must be done well to protect from the insect pests and fungous diseases? I say the orchards are crying for this all over the State of Maine. It isn't alone to be found in the potato crop, but it is also in the orchard.

I have been spending the last week in Aroostook County, and I tell you, friends, it is a sorry story which I might tell. Those farmers there that have been growing large crops of potatoes realized this year a larger crop than ever before, per acre, but for some reason those potatoes have been decaying badly. The statement has been made by Prof. Morse, who has been investigating the situation, that 95% of the work done in Aroostook County in spraying potatoes has been imperfectly done, and that he found only two fields in four days which give evidence of thoroughness in the application of the agents used for destruction of fungous diseases.

Does that apply as well to our orchards? I am not going to say it does, but I do want to urge as one of the most important steps in caring for the orchard, the insuring of protection to the individual tree. Every tree has a right to demand of us that we give it the opportunity to do the very best it is capable of; and no man is true to his orchard who is failing to do this. A tree, like a man, has a right to be judged from its best side; and we are not doing our duty unless we give every one of them the chance that comes not only from right setting and right care and right fertilization, but also from careful protection, and that protection means thorough spraying. We must do our duty in these respects if we are to meet the conditions of the market which are facing us today, and which are coming up to us with ever increasing force. The conditions which are facing us have changed radically within the past five years, and will change still more in the next five. If fruit growing is to be something more than a side issue,—something more than a pastime,—and if we are to consider this as one of the great industries of the state, as it well may be, then it becomes our most solemn duty to ourselves, our families and to the trees, that we set out those varieties which promise to be most valuable in the market, and then give them that care and attention which will help develop the most perfect fruit.

The presence of imperfect fruit must be eliminated to the largest possible degree. That we all recognize. And yet we fail too often to apply the lesson. I say it must be eliminated, because the doors are closing all the while more and more upon this class of fruit. Do you know that the state of Idaho, by stringent legislation, forbids the shipping of a No. 2 apple out

of its borders. They allow nothing to go out of the state of Idaho except No. 1 fruit. That is pretty stringent legislation. It is a good deal more than the people allow in the State of Maine, where some are now criticising our law, yet growers in the West tell me that within two years they found it had been the greatest blessing they could possibly have had, and that the price of No. 1 apples improved so much that they were realizing more for their selected crop than they were getting before for the whole. The great bulk of the No. 2 and lower grades were being fed out to the hogs or destroyed and profits are being multiplied.

Now we don't propose any such legislation in New England, but towards that we are going to be forced—forced because of the conditions which confront us—forced because of the competition we are to meet—forced by the quality of apples which are coming into New England all the while from western states, where the conditions are so rigid and exacting that only the choicest quality of fruit can be grown, and because the orchards are multiplying rapidly. Do you not see that if we are to hold our own the standard of appearance and quality of our fruit upon the market must approach that from the West, for then we can hold our own and lead in the market as we have in the past. I believe, friends, that we can do this. I believe this is possible for us, every one, and also that we must adopt this matter of thorough spraying as an absolute necessity.

Another factor to be considered is the power of resistance on the part of an apple which has been carefully and thoroughly grown. I do not stand here to suggest that we can grow a resistant apple. Yet it is towards this that the study and investigation of our scientists of today are being directed. We know that some varieties and individual trees are more resistant than others to the insect pests as well as the fungous diseases, and this suggests a line of study. The care of the orchard lies along this line. The study of this question of resistance will perfect our trees and strengthen them, because it comes in this way, through the vitality of the tree we shall find that resistance to disease may be made certain, we all the time helping, as is necessary, by the use of outside applications.

Then comes the humane handling of the fruit. As I have been going about I have seen apples picked from trees and piled

up in the orchards to lay two or three days in which they would "sweat out" as the owner said, and then be gathered up and carried into bins or cellars. Is it good business? Is this in line with the life of 1910? I am looking at this question from the commercial standpoint, first of all, and that is the point that touches us all. I am thinking of the dollars and cents which may be realized from our orchards. In order to do that we want to make certain that our methods of handling the fruit are humane—best for the fruit and its preservation—best for the conditions under which we are going to put it on the market.

Then comes the question of sorting and packing and branding. I believe in all sincerity that the law put upon the statute books of Maine last winter by the friends of good fruit is going to do more to bring about this better condition, this more uniform quality, evidence of which we have here on these tables today and which we will find in the markets, than anything which has come to the State of Maine for a great many years. I believe there is nothing burdensome in that legislation, that it will help insure the care of the orchard just so far as legislation can, and in the enforcement of the law we will come nearer to the wants of the tree and its best feeding and care, and protection and marketing of the fruit than we can come in any other way.

But there is something more necessary, and that has already been suggested this morning in that admirable address of Prof. Hurd. I wish it might be put into the hands of every man who ever thought or desired to grow an apple tree. Co-operation is the basis of success today through the West. We are fighting single-handed and alone in New England, some of the strongest unions—corporations you may call them, give them any name you please—but we are fighting some of the strongest organizations that could be perfected, where the product of the individual man is lost as soon as he delivers it at the central station, and where he is known only thereafter by a number, and where all his fruit is taken and carefully graded under the most rigid system. That fruit is put upon the market, and when the returns are made he then gets what is his due. I say we are fighting single handed and alone, and this great question of coöperation and of union among those who are interested in



this subject is one of the most vital questions if we are going to undertake the care of the orchards and make them profitable in the largest degree.

The figures of Prof. Gardner this morning suggest, it seems to me, from the financial standpoint, what may be possible. What are those trees worth to a man, allowing forty trees to an acre? Why, upon the cultivated section those trees are paying him net about \$2.10 or four per cent upon a valuation of \$50 a tree. What does that mean? It means \$2,000 an acre. Are we putting the right estimate upon our trees? Are we valuing them enough? It seems to me the higher value we put upon them the more likely we will be to appreciate their wants and meet the requirements of the situation as it confronts us today.

I don't believe that there is any successful future for a man in orcharding unless he has a love for the orchard. I question whether you can force trees today,—whether there is not needed that invitation which comes out of partnership. And for that reason this commercial work which is being attempted too often is a positive injury. It has been with us. It will be again. Let me cite a case. Among the many letters coming to my desk from men all over the country asking about farms in Maine (I have had two or three since I came here yesterday) or orchards in Maine, was one from a gentleman in New York who wanted to know about what varieties are best adapted to setting a large orchard, and I named two or three as adapted to that locality, being somewhat familiar with it, and considerable correspondence ensued, until finally he wrote and said: "I want to ask you one more question." I had given 40 feet to a tree as the minimum space, unless he wanted to use a filler. And then came this question: "If we should set 100 trees to the acre, wouldn't that orchard be worth \$400 an acre in four years?" I replied: "You go on and set 100 trees to an acre and in four years your orchard will be worth four dollars an acre." I was dropped then as not good authority in orcharding. Just think of the business method which is involved in any such work. Isn't there any necessity for protecting our orchards? Isn't there any value in standing to protect the industry? Because you and I know it is only necessary that we make these hills all over the State of Maine, through the fruit belt, bright with apple blossoms,—that we cover these hills with the varieties



adapted to the location, and then give them the care and fertilization, the attention, the pruning and the spraying necessary, in order to make every tree pay a yearly net return of more than four per cent upon a valuation of \$50, after ten or twelve years old.

Now that is not an extravagant claim. I think any of you will justify it. It has been repeated so many times in the history of our growers, even under conditions which have existed, that it is safe to make that statement. That being so don't you see the importance of that illustration, and how safe an investment can be made today by any man who is in sympathy with trees and will see that they get the care and attention necessary?

I said in the beginning that some conditions were to be met that didn't exist before. We run right up against them involuntarily. This nation was founded upon the thought of individualism,—the individual's right to do about as he pleased so long as he conformed to the law. The conditions which face us today are away from that standpoint. It is the mingling of the individual thought, the destruction of that individual life, which has been so prominent in this country in years past—it is the coming together and the binding together and uniting for the carrying forward of the great industries of life, and what is true of Standard oil, what is true of sugar, what is true of steel, and what is true of woolen, or of cotton, or of any other great industrial line, applies as well and will apply with equal force along this line of fruit growing or any agricultural work of the future. We must study this question solely with reference to our necessities today, and prepare for the increasing demands of life tomorrow. In order to do that there must be a bringing together of individuals, and the coming together and massing of our products in the hands of men who are expert enough to handle and direct and control them so that the grower may realize as he cannot today in the market. Doing this work in this way we will meet the call of the orchards, and find our hilltops are gold mines, for while we may not draw the metal out of the depths with windlass or bucket, we will call it up through leaf and bud and branch and luscious fruit.

WHAT WE CAN LEARN AT THE NEW ENGLAND  
FRUIT SHOW.

(Stereopticon Lecture)

PROF. E. F. HITCHINGS.

*Mr. President and Ladies and Gentlemen:*

I was asked sometime ago to give you an idea of what was to be learned at the New England Fruit Show. Some of you were there, and I am very sorry indeed that you were not all there; because it seemed to us that it was an object lesson that ought not to be lost on any fruit grower in New England. I have prepared some slides that will be thrown on the screen, and will endeavor to give you a sort of a bird's eye view of what we held in Boston as a New England fruit show, the first of its kind ever attempted.

I will first go back a little and give you the history of this movement. Last fall, at the meeting held by the governors' conference, one of the principal speakers was a fruit man, well known to many of you. His address attracted the attention of the fruit men present, and especially the nursery inspectors of New England. So a meeting was called soon after at the State House, and at that meeting the inspectors proposed securing, if possible, uniform nursery laws for New England. In the discussion that followed, one of the members, Prof. Sanderson of New Hampshire, suggested a New England fruit show. Every one at the meeting was then enthusiastic over the proposition, and later on when we held another meeting and devised a scheme to secure, if possible, uniform laws for New England, this other plan materialized.

If you are not all familiar with the statutes passed last winter affecting the fruit interests, I wish you would become posted. There are several acts; the law that has been cited several times regarding our packing of fruit is one, but the one to which I wish to call your special attention is that relating to better nursery stock. You know that Maine has had the reputation of setting out the refuse stock of New York and other centers. You know, those of you who set trees forty and fifty years ago, that not one in a hundred of those trees lived, so you did not

know whether they were true to name or not. In recent years some of you have, as the boys say, "got stuck." You have ordered nursery stock of certain varieties that you wished to set. The trees came, and you set them out. If they lived to fruit, you had all sorts of fruit; and where you ordered Baldwins perhaps you got Ben Davis, or some other apple of inferior quality. Now the new law requires that each agent, or each person, who sells nursery stock in the State of Maine shall have a license, that license to be issued from the Department of Agriculture. So if a man comes to you and wants to sell you some nursery stock, and you ask him for his license and he can't show you one coming from that department, you may put him down as being not legally in the business. I think you will agree with me that this is a step in the right direction. It originated with this idea of the New England fruit show.

Another lesson that we learned at the fruit show, I think many of you who visited the show will agree with me, is that we are planting too many varieties in Maine. I spoke the other day in a town not far from here, where a man had an exhibit of fruit, and I found in conversation that he had quite a number of varieties, so I asked him: "How many varieties of apples have you in your orchard?" He replied: "I have one hundred and forty-seven." Just think of it! A sane man in the State of Maine worrying over a product of one hundred and forty-seven varieties. He is a good deal like the young man that only a few years ago asked me: "How many varieties are there that I can grow in the State of Maine?" I said: "What on earth are you driving at?" "Why," he said, "I want to set all the varieties of apples I can so as to take them to the fairs and get all the premiums." If that is what our young men are going to do in orcharding for the next few years, they would better go into something else. We saw all sorts of names up there at Boston. A man from Maine entered ten leading varieties. One of those varieties was marked "The Schoolhouse Apple." Some of you may be familiar with it. I was familiar with a schoolhouse apple when I was a boy, that is, an apple tree near the schoolhouse. The apples didn't stay on it very long. It might have been a schoolhouse apple.

Now that is one mistake we are making; and if you have got forty varieties I would top work more than half of those. Those of you who were at the show I think learned that those apples

which were not of the known varieties received no blue ribbons. The lesson ought to come home to us not to put on exhibition any apples that have gone by and have served their purpose, when there are so many nice, leading varieties that we can use to advantage.

This New England Fruit Show is an incentive for better fruit for New England, and our end of it means better fruit for Maine. Now are we in it for that? If so, let us touch elbows, and not only that, but grasp hands and agree that it shall be better fruit for New England hereafter.

An old gentleman came in with the secretary of the association and as he was viewing the apples I was introduced to this man. I had known him by name and reputation from boyhood. That man was James J. H. Gregory, of Marblehead, known to all of you, the veteran seed man, now eighty-two years old. And as I stood with him he gazed at the bank of Maine apples and this is what he said: "Do you know what I am going to do? I am going to deposit a one thousand dollar first mortgage bond with the secretary of the New England Fruit Show, the interest of which in five years shall go to the best developed acre of fruit trees in Maine, planted in 1910. The suggestion was made to Mr. Gregory that he deposit the bond with the Maine Department of Agriculture and a little later he carried out this plan. In the conditions he eliminated one apple, the Ben Davis.

Now that pleased me very much. I have always preached against the Ben Davis, although I had some co-workers with me up there at the New England Fruit Show who are growing this variety, and in fact, I introduced one of them to Mr. Gregory at the time just to show him that he was out of the race. But do you know that man, right from your own county here, was so much pleased over the offer that he said to Mr. Gregory: "I want to present you with my best box of apples in this exhibit. Select the box." He did so and it was not a Ben Davis.

Now there is an incentive for each one of us here in Maine. It shows that men of means are interested in the future of better fruit for Maine. Mr. Gregory said: "I fell in love with Maine people almost as soon as I started in business." And you know he has been in business since you and I were boys.



I want to give you a little idea of what that show meant as a direct object lesson. I have cited some of the different incentives that may come to us in other lines, but I want to call your attention to some few figures that I have here. I have been asked the question how Maine stood in the New England Fruit Show. I will give you the figures. In one room, in the division called "G," where the plate varieties were exhibited from all over New England, there were about one thousand plates of apples on the table—straight apples—and about five hundred more of unnamed varieties of apples, and grapes, pears, peaches, etc. How did Maine stand? Massachusetts was on her own fighting ground. Her exhibit came from her pomological men, and I am sorry to say Maine's did not except in a few cases. Of the premiums offered, three hundred dollars on those plates of apples was given by Worcester County. And the men who entered were Worcester men, who had entered in competition with each other for years, the old members of the society.

Maine was handicapped as the Massachusetts fruit matured and colored two weeks ahead of ours. And yet I want to give you the result.

In this one class Maine had 247 plates, New Hampshire 102, Vermont 27, Massachusetts 290, Rhode Island 16, Connecticut 107. How about the ribbons? Maine, under all those difficulties, received 43 ribbons to Massachusetts 7. How is that? I was proud of Maine. If we could have entered in competition with that Massachusetts fruit, this fruit shown on the tables to-day of the leading varieties, that score would have been different.

Now you say, "Well, Maine took all the fourth premiums and Massachusetts the first." Let us see. Maine out of that number took 16 blue ribbons, Massachusetts took 2, and so on down the list. In the fourth premiums, Maine took three and Massachusetts two.

I will show you the hall in which were the state exhibits from New England. There were ten from Maine and eleven from Massachusetts. New Hampshire had 9, Vermont 2, Rhode Island 5 and Connecticut 6.

In regard to Grange exhibits, nine granges from Maine made exhibits, three from New Hampshire, none from Vermont, only one from Massachusetts, one from Rhode Island and one from Connecticut. So Maine led all of the others put together.

Now for a total. A good many have asked me how we stood as to the amount of fruit carried. Maine had 588 boxes, New Hampshire 54, Vermont 16, Massachusetts 74, Rhode Island 22, Connecticut 132. In other words, we had over 500 boxes more than Massachusetts, and almost 500 more than any other state. We had 28 barrels, New Hampshire 18, Vermont 5. Massachusetts only led us by 3. Rhode Island had 24 and Connecticut 25. So you see we led in barreled fruit all the states except Massachusetts, which had three barrels more than we did.

I want to say one thing in regard to the scoring of some of this fruit. We must get hold of the idea of getting our fruit in a better condition—more perfect fruit. I am sorry to say that some of the Maine fruit wasn't up to standard, and wasn't up to what you would ordinarily expect in some of our grange fairs or our state fairs or county fairs, and that was one thing that scored against us heavily. Another thing which told against us was the admission of the Ben Davis. I had to fight to get this and I suppose I was too firm, and yet I know that the men who are backing the interest here in Maine would have been rather sore if the Ben Davis had been left out entirely. The committee when I first mentioned the Ben Davis, laughed at me. I fought to get it on the list and now I am sorry I did. I did it for the interest of some of the leading fruit growers of Maine. I wish you could have been there, some of you advocates of the Ben Davis, with those judges for a few minutes. I tell you, you would have certainly come home and top worked your Ben Davis trees. Now you may think I am rather radical and using too forceful language against the Ben Davis. It is a handsome looking apple, and sells well in some of the markets. But do we want to advocate a poor quality of apple just because it sells in the market today? How will it be ten years from now? "Yes, but," a man tells me, "it has been in the market twenty or thirty years. We have sold it across the water and we are going to right along." Possibly you are. But I tell you I would rather run the risk of the good old Baldwin, the king of apples, than to depend upon the Ben Davis much longer. They make nice trees to top work, and I would do it at once.

Every time those judges, where there was any competition, (of course in our state exhibits in Maine they had to count it) ruled out the Ben Davis. They may not have been right in doing

it, and it might not have been just, yet they did it, and we lost the grange premium of one hundred dollars, which would have come to Maine if it had not been for the Ben Davis apple. Those twelve plates entered by one of the Maine granges stood next to the Worcester grange exhibit, and ours had the Ben Davis in it and was scored out on account of the apples in the Worcester exhibit being of better commercial standard. So you see we lost one hundred dollars on that score.

In remarks made here a short time ago, one gentleman referred to our apple trees here in Maine and spoke of an apple tree being worth fifty dollars. Well, let us take an apple tree thirty-five years old, for instance, as being worth fifty dollars. Now I will leave it with you gentlemen, if you have a fifty dollar cow in your barn, will you treat her as you have treated the fifty dollar tree in your orchard? Let us be honest with ourselves, and go home with the determination that we will give our orchards more care. We will cut out the dead trees and treat the diseased ones.

We have these orchard conditions today, and we know what to do; let us go home and do it. There are a few orchards in Maine to which this lesson need not apply, but there are very few of them. You can count them on one hand, perhaps. And on the 60,000 farms in the State of Maine, how many orchards are there? Why, I will venture to say not ten per cent that would go by the designated name of an orchard. We are neglecting our trees. We are allowing our orchards to go down just because they had a blow three years ago,—the winter killing. If we would eliminate those old dead snags, and give the sick ones good treatment, just the same as we go to a dentist and have our teeth fixed, we would see, in the next five years to come, or even less than that, some results.

I will now proceed to the pictures. This is the room where the largest exhibit of fruit was on the tables, showing you some 15,000 plates in all. This of course does not include the immense display of Baldwins. The photographer had to stand back to the tables where the Baldwins were. And those of you who went there remember that that was one of the greatest object lessons of the whole exhibit, the immense table of Baldwins from all over New England. I am sorry to say that Maine was cut out on the Baldwin question for the reason that our fruit was not matured. It had not the color, and it would

not have reached the size in many cases, on account of being grown in sod rather than in cultivated land. The judging of the Baldwins there was quite a task. There were five premiums. After the judges placed the blue ribbons they were obliged to remove them by our request on account of the apples having on the blow end of them the San José scale, every specimen containing some of this scale. That was strictly excluded from our exhibit whenever detected. The judges had overlooked the fact, and had to remove all the ribbons and replace them again. That was done on the state exhibit in Connecticut in the same way after the ribbons had been placed. After that the judges were more careful where they placed the blue ribbons, so far as the San José scale, or oyster-shell scale was concerned. I found the oyster-shell scale on some Maine apples. Look out for it.

Here is a comparison of the largest apple and the smallest, the largest measuring about seventeen inches in circumference, the smallest about a quarter of an inch in diameter. The smallest apple shown there was taken from a tree that was brought in in a flower pot, and I will show you later on a dwarf pear, a tree that was grown in the same way, only the fruit is a little larger. The large apple is the Wolf River.

The next view shows one of the special baskets of fruit that took a blue ribbon. In that room marked "G" there were a large number, some thirty or more, fancy baskets of fruit. We also see some of the finest grapes that were exhibited at the show. There were 161 plates of grapes exhibited.

We here see one of the cups presented by the International Fruit Growers' Association, and Governor Dresser's cup, a seventy-five dollar cup, that was given for the best display of Baldwins.

As we enter the other main room from the one I have just shown you, we come to the exhibit now on the screen. To the right you will see a portion of the bank of Maine apples. In the center you notice the immense apple, made onto a frame work and covered with crab apples. The school children of the city were allowed to come in each day between the hours of ten and eleven, free, and men distributed apples to each of these school children. I heard some of the remarks made by those children as they came and looked into this room. "Why," they said, "what an immense lot of cranberries it took to cover



that apple." They called the crab apples cranberries. They had never seen an apple outside of the market, possibly, and some of them had never tasted one. Their eyes glowed, and our president got some extra smiles for extra apples.

In this view we see the pump that was won by one of your townsmen here, Mr. Herrick, for his display of excellent fruit, and beside it Mr. Herrick's box of fruit that took the grand sweepstake. And I wish to say that Oxford County won many prize laurels. The fifty dollar premium offered by the state grange was won by Oxford County, and Mr. Herrick of your county brought home many dollars besides this machine, a hundred and thirty-five dollar machine, donated by the Douglass Company.

He would have had the one hundred dollar premium on his barrel, but it lay between a barrel of Gravensteins and a barrel of McIntosh Reds, and the committee decided in favor of the McIntosh Red, claiming that was a better commercial variety.

We have a view here of the sweepstake box and the barrel.

This view shows the Maine bank, 333 boxes in one bank of Maine fruit, Mr. Cummings, of West Paris, having a block in there of one hundred, and the secretary of your association another block and so on. Mr. Morse and several others who are present are represented there.

This was the cider press that was run day and night. The product was called apple juice, five cents a glass. This was made from the apples contributed by the secretary of the association and others who furnished apples for the undertaking.

We now see the exhibit that won the governor's cup. You notice the cup is sitting on a barrel of apples. That was for the best barrel of Baldwin apples and it was an elegant display. There should have been a display from every New England state, but this was the only one.

The next slide shows another plate of Baldwins that took the blue ribbon, the first prize on Baldwins. It gives you only a slight idea of what the apples really were.

This shows one section in room "F," so called, where the state exhibits were displayed, and also the grange exhibits. The one on the upper shelf you will see is marked "Class F." The display of twelve plates on the upper one was the one that took the \$100 cash premium for the best grange exhibit, by Worcester Grange.

Here was the Connecticut display just on the opposite side of the hall from the Maine display, right across the way, showing the arrangement of their fruit and their bank of fruit, with the fancy baskets and crates of peaches. Connecticut, of course, has the peach, and Mr. Hale, the man who was to have been here to speak, is the peach king of the United States.

We have next a nearer view, showing the basket in the foreground with the prize ribbon, a basket made up of pears, grapes, peaches, etc.

This view, I wish you all could have time to study and understand just what it means. If you read the chart you will see what it says. Those circular lines show the diameter of the trunks of the trees upon which fertilizer has been used. You see the smallest one marked, "no fertilizer," the one at the left, "ashes," and so on, and the piles of apples that correspond to them.

The next slide shows an elegant display of fancy fruit.

This is that dwarf pear tree I told you about, and just in the background, at the right you see the dwarf apple tree. The size of the fruit is very large compared with the tree, as most of you know if you have grown a dwarf tree. It was one of those trees set in a pot with the fruit growing on it. Many thought the apples were stuck on or wired on, but they were genuine articles.

This slide shows two plates of contrasted fruit. The fruit was taken from the same orchard, one from trees sprayed, the other unsprayed; the one covered with San José scale, the other free. Those were Baldwins and were exhibited by Dr. Fernald of the Massachusetts Agricultural College. There is a true example of the effect of the San José scale when left to run riot. Massachusetts is full of San José scale, as is in fact almost every other state but Maine. We have a little of it but we are going to exterminate it, if we have to cut down the tree.

Some of you may have had your orchards stripped this last year by the forest caterpillar, so-called. In October, in preparing the entomological exhibit, we had occasion to see the effect of that caterpillar. I had Mr. Yeaton go to an orchard that I know had been thoroughly stripped by this pest, with the result that we found the trees in bloom, blossoms all over them, where

nature had tried to do her best to counteract the effects of that caterpillar, the trees leaving out and blossoming again in the fall.

The last slide shows the grand sweepstake barrel to which I have referred. You can see the blue ribbon on the barrel. It gives you an idea of the first-class condition of the fruit in every way.

## REMARKS BY DR. GEORGE EMORY FELLOWS,

President of the University of Maine,  
At the Annual Banquet.

*Ladies and Gentlemen:*

I have been devoting something over thirty years to the preparation of what I may say here tonight, and I can hardly condense it into five minutes. I want, however, to call attention to the possibilities of development in such an association as this.

I was visiting at the University of Wisconsin last year, and I learned there that the farmers in Wisconsin who were growing corn had formed themselves into a corn growing association, an experiment association they called it, very much like these dairy cow testing associations that are being formed throughout the East, and about which you know something. The result has been, from the co-operation of farmers who are interested in growing corn in that state, that corn which would not mature above the forty-second parallel or thereabouts, has now been made to grow as far north as Lake Superior,—Dent corn, solid and mature, such as is grown in central Illinois. This is practical. That means hundreds of thousands of dollars in the pockets of the farmers who belong to that association. The same kind of work may be done by the members of this association, if you organize in such a way. Without doing anything new, each person becomes aware of the work of every other person who has been successful. Just a word on that, to throw out as a hint.

It takes fifteen or twenty years, I understand, to bring an apple tree to such maturity that it is profitable. Is an apple

tree, or a field full of apple trees, any more valuable than another product of the farm that it takes about fifteen or twenty years to bring to maturity? The young men and the young women that grow up on our farms are worth more than many apple trees. They have not the opportunities in modern life that some of you have had to learn the practical workings of your everyday business. A short statement of what I might take hours or weeks to get at is this, that in the present complicated life of the modern world it is absolutely necessary that we have special training in our work to compete with others who have had it elsewhere.

To give a practical illustration: Germany was said to have conquered France in 1870, and thus redeemed the great humiliation which Germany suffered under the great Napoleon at the beginning of the nineteenth century, through the work of the German schoolmaster. Twenty-five years ago I suppose it could be said that Germany was the best educated nation on the face of the earth. But it was educated in a kind of philosophy and literature and science that made scholars only—intellectual scholars, but not the practical men that Germany now produces. What is the difference, and why the change? A simple incident will illustrate the whole thing.

In 1876 we held our Philadelphia Centennial Exposition, and the German commissioners came over here. And they had been here but a day or two, looking over the exhibits, before they cabled back to the new chancellor of the German empire: "Our German goods are cheap, but wretched." That is all they said, and all that was necessary. If German goods were wretched, something had to be done to make them better. And you know the result. You can hardly pick up a piece of cutlery or manufactured article in your own homes without finding it stamped "Made in Germany."

And why is it? Because Germany, on account of the humiliation at such a despatch about its goods, immediately set to work to train all the workers in Germany to do first-class work, through the use of industrial schools. And in twenty-five or thirty years (not thirty years since the schools were established, only twenty-five years since they were running) Germany stands in the forefront of all this earth in manufactured articles. And we must look to our laurels if we maintain a successful competition in any part of the world. That is on the industrial side.



Now let us get at the agricultural side, which this body more particularly represents. Twenty years ago there was no nation in Europe so low agriculturally as Denmark, that little Kingdom away up in the corner of Europe. And today, if you read your farm papers, and the literature bearing upon agriculture, you know there is no nation in the world that stands higher in agriculture than Denmark. And what is there to account for it? Just the same kind of thing that accounts for the industrial superiority of Germany, except that Denmark has done it agriculturally.

Denmark, all told, is about one-half the size of the State of Maine, not over that, and in it are an agricultural college and twenty allied agricultural schools,—special agricultural schools. And in those schools are four thousand students. And in addition to that, there are seventy-eight people's high schools in which agriculture is taught. Without going into details, you can draw your own conclusions. I repeat, that agriculturally, Denmark stands highest on the continent of Europe. There is enough to account for it. There are six thousand pupils in these seventy-eight schools, in addition to the other four thousand. There are ten thousand pupils at one time in the little kingdom of Denmark, half the size of the State of Maine, studying agriculture.

We have only one institution in this state that is definitely teaching agriculture now. Others are beginning to do something. We are very glad of it, and hope there will be more. But we have only to look around this room, and around the exhibits that you have here at this pomological meeting to see some of the effects of agricultural instruction right here in our midst. Half a dozen of the leaders in your own work are right here among you. We don't want to brag about ourselves, but we are proud of some of these young men. I think there is not one of them who has been three years away from the agricultural school, and yet they are making their mark in the management of farms, in the department of agriculture, and in other walks of life connected with agriculture.

The State of Maine, in its legislature last winter, appropriated a small sum of money for the purpose of investigating the needs and advisability of some kind of industrial instruction; and the state superintendent of schools, together with a committee com-

posed of the president of the State University, the master of the State Grange and two or three other gentlemen, representing large interests, educational and industrial, are going to commence the investigation of that subject. And I believe we can count upon every person here, who is engaged agriculturally or industrially, when he fully understands the scope of it, to support any movement that may be made for the establishment of technical instruction in your own communities for the education in practical lines which will make the young man and young woman work more effectively in their life work. May we not count upon you, and feel sure that we can?

If Denmark, half the size of the State of Maine, has more than a hundred agricultural schools, and if Belgium, less than half the size of the State of Maine, can support, with its agriculture and its industry, six millions of people, and support them well and happily, what may not be done in our own state, with its wonderful facilities, not only in manufacturing of all kinds, through its water powers and its forests, but agriculturally? There are enough resources here in the State of Maine to support a population of five million people.

Let us join together in the movement that is now beginning for the education of the young people in the practical affairs of life, so that they may have all the force behind them that has accumulated from the experience of others in the past, plus the technical training which will help them to bring about such results as you have seen illustrated this afternoon on the screen. It is a proud thing for us, is it not, that that immense exhibit in Boston, which attracted more attention, I am told, than any other exhibit there, was packed by University of Maine students. Those students have had very little experience. Some of them, I dare say, have hardly had a month's instruction in horticultural work and in the packing of apples. And if those results can be accomplished with such little instruction, how much more can be done, not only for the few but for the whole state, by a careful system of instruction.

## ADDRESS TO YOUNG PEOPLE.

PROF. V. R. GARDNER.

*Mr. President, Girls and Boys:*

I suppose all of you boys and girls have in mind some day to be famous. I doubt if there is one of you but hopes to be a big man or a big woman some day. Some of you perhaps are hoping to be big lawyers. Some of you are hoping to be big business men, and handle some of the big business interests of the state. There may be some here who want to own a railroad, or a steamship line; or there may be an aspiration to be governor of the state. And who knows but some here may be governor of the state or President of the United States?

But I want to say to you that it is not only the commercial and political positions that count. There are other lines of work. There are other fields in which you can be just as big men and just as big women as you can in political life or in the so-called commercial world. I refer especially to some of the various branches of agriculture at the present time. If I were to ask you students here who is the biggest man in the United States now, probably you would say William Taft; or you might say Theodore Roosevelt, who is soon coming back; or you might name someone else. You might name your own Senator Hale; or Senator Cummins of Iowa. There are, I presume, a number of men that different people would pick out as among the biggest men in the country.

Now those men may be the biggest men in the country, but I think there are men just as big as William Taft in the country at the present time, just as big as Theodore Roosevelt, just as big as some other men that have been mentioned, who haven't labored in exactly the same lines that those men have, but who have done just as much toward building up the general commercial and industrial welfare of the United States. I know some of the big moneyed men like Harriman and Hill have been criticized, but nevertheless these men have done wonders for the United States. There are a number of men in positions in agriculture, like Secretary Wilson, of the U. S. Department of Agriculture, like Gifford Pinchot, who is running the forestry

department of the United States, like Dr. Webber, or Dr. Swingle, who are really doing as much for building up the welfare and prosperity of this country as any men in the so-called commercial or political life.

If I were to ask you who is the greatest man in New England, I can hardly guess whom you would mention. New England has produced many great men, and there are a great many famous New Englanders at the present time. You might point to your own senators in Washington. You might point to your own governor. You might point to Aldrich, of Rhode Island. You might point to some Massachusetts great men. But I am here to say this morning that there are farmers in New England that are as famous the country over as any politician in her limits.

I am thinking of one man in particular now, and that is J. H. Hale. I came from the West, and I heard of J. H. Hale, the big fruit grower of New England before I heard of Aldrich. I heard of that Hale before I heard of Eugene Hale of this state, the senator. And J. H. Hale is a farmer.

If I were to ask you who are the biggest men, the most looked-up-to men, in Oxford County, I cannot say who would be named. There are a number of men of state reputation, at least, in the County of Oxford at the present time. There might be some dry goods men among them. There might be some grocery men among them. There might be some proprietors of planing mills, or of lumber mills, or shoe factories, or representatives of other industries among them. But I dare say there would be a good liberal proportion of farmers among them, men who are raising apples and potatoes and cattle.

I mention these things because young people often get the idea that to be famous they have got to be in politics, or that to make big men out of themselves they must enter one of the commercial lines. That is not the case. The men who can grow apples like those on exhibition here in a twenty acre orchard or a fifty acre orchard (and it is within the power of any one and every one of you) is destined to be more famous at the end of ten years, or twenty-five years, when you will be right in the prime of your life, than the man who is ward boss or county politician, or the man who is running your biggest shoe factory, or biggest lumber mill. For this is the kind of industry that is developing at the present time.



You hear much about the West, and many people tell you to go west if you want to get rich, and want to make a big man out of yourself quick. But lots of people in the West are telling their children to "go east, that is where you will have the best chance." And you do have just as good a chance here in the East as can be had anywhere in the United States.

Do you know who the biggest man in Iowa is at the present time? There are a few men there who raise five thousand acres of corn each year. Those are the big men of the State of Iowa. Do you know who the big men of Oregon are? They are men who have orchards worth two thousand dollars an acre, and not the men in the legislature. I call your attention to a few of these things so you can see there is an opening for you right here at home, on your own hillsides, and in your own valleys. I am putting up a plea for you to stick closer to the soil, and solve its problems. I tell you there is a great satisfaction in being able to take hold of nature's sunshine, nature's rain and nature's soil and make products out of them which are really worth while. And I want to call the attention of you students to the possibilities of farming, and especially fruit growing, right here in the State of Maine, in Oxford County.

## PROGRESS IN THE STUDY OF APPLE DISEASES AT THE MAINE EXPERIMENT STATION.

By CHARLES E. LEWIS.

During the past two years, the Department of Plant Pathology of the Maine Experiment Station has devoted considerable time and study to the diseases of the apple, making this one of the chief lines of investigation. At the meeting of the Pomological Society last year, Professor Morse gave a paper in which he outlined the work which we were doing and told you something of our plans for this year. The work has been continued and we feel that we have obtained results which cannot help being of value to the apple growers of the State.

In taking up this work, one of the first things which we have had to do was to become acquainted with the orchard conditions and with the diseases present in the State. In traveling through Maine, it becomes evident even to a casual observer that there

are many apple trees which are unhealthy. It is not always so easy to determine the exact cause of the unhealthy condition. We have tried to become familiar with the diseases by visiting orchards, by having material sent to us for examination, and by careful laboratory study and inoculation experiments.

There are a number of things which may give an apple tree an unhealthy appearance or may even cause its death. Among these are: winter killing, poor drainage, lack of nutrition, failure to cultivate, and attacks by fungi and insects.

It is readily seen that the most of these causes of diseases are directly under the control of the apple grower. This control should begin early, in the selection of a good location for the orchard, and in properly preparing the land before the trees are set. This should be followed by giving the young trees the same amount of care that would be given to other growing plants. It is rather unusual in our experience to find a man who is giving as much attention to his young orchard as he would give to a crop like corn or potatoes from which he expected to receive returns the same year.

By practicing what might be called good orchard management, many of the causes of unhealthy trees would be entirely removed and others would be partially controlled.

The control of diseases caused by fungi requires in some cases special knowledge of the fungus concerned but in most cases the apple grower could protect his trees and fruit by simply following the methods of treatment which have been recommended by Experiment Stations, Agricultural Colleges, and successful orchardists even though he knew little about the causes of the disease. It is natural, however, for us to take greater interest in things of which we have some knowledge and it is easier to fight an enemy if we know its methods of attack. For this reason it seems well in this paper to discuss the characters of fungi before taking up diseases caused by fungi.

Fungi are low forms of plant life, they do not have the green coloring matter with which we are so familiar in the higher plants, and for that reason they are unable to manufacture organic food. There are many thousands of species of fungi which differ widely in form and manner of life. All fungi, however, agree in certain characters. They are all composed of

little threads called hyphae. This structure can be seen very easily in such a fungus as the common bread mold. Fungi differ from higher plants in being reproduced by means of spores instead of by seeds. Spores are very minute bodies which are invisible to the naked eye but are easily seen with the microscope.

A few examples of fungi with which you are familiar will help to make the characters clear. The common toadstools which we find in the woods and fields are fungi of large size. The part of the toadstool which we see above the ground is called the fruiting portion because it is the part which bears the spores. The spores of a toadstool are borne in large numbers on the gills on the underside of the cap. The part of the toadstool which appears above the ground is not the entire plant. There is a network of fine threads of hyphae called the *mycelium* which grows through a considerable area and absorbs food from the organic matter contained in the soil and it is only when this mycelium has stored up a sufficient amount of food that the fungus fruits and we have the toadstool.

The large shelf fungi which occur on old trees and logs are quite hard and woody in some cases but they have all the essential characters of fungi in that they are devoid of green coloring matter, are composed of threads, and reproduce by means of spores. The spores of these fungi are borne in the little pores on the under side. The mycelium in this case spreads through the wood getting food for its growth and causing decay.

In the fruiting part of a toadstool or shelf fungus, the thread-like structure is not very evident unless the body is torn apart and examined because the threads are woven together in very compact masses so that the individual threads cannot be easily seen.

We all know that if a piece of bread which has been exposed to the air is put in a moist place it molds. The spores of the mold fungi are very small and are present in the air of almost any room. When the spore of the mold falls upon the bread and finds suitable conditions of warmth and moisture, it begins to grow. A little tube grows out from the spore. Later this tube branches and continues to grow until a much branched mycelium is formed. When the mycelium has stored up suffi-

cient food, the fungus fruits by sending up little stalks each of which bears a sac called a *Sporangium* which contains a large number of spores.

We have seen that fungi differ greatly in form and in their manner of reproduction. They also differ in the source of their food supply. Some fungi are able to get their food only from dead organic matter and are called *saprophytes*. The other class is able to attack living organisms and they take their food from that source and are called *parasites*. It is with *parasitic* fungi that we are most concerned in the study of plant diseases. However, in many cases it is only possible to determine whether a fungus is a *parasite* or a *saprophyte* by carrying on extensive inoculation experiments.

Several lines of study have been carried on at the Station in connection with apple diseases. In the summer of 1908 cultures of fungi were obtained from apple leaf-spot from orchards in a large number of different parts of the State. In all, 13 species of fungi were isolated from the leaf-spot, several of which have been regarded as causes of the disease by Experiment Station workers in other parts of the United States.

Inoculation experiments which were carried on in the early part of the summer of 1909 show that only one of these fungi is capable of causing the leaf-spot on uninjured leaves. When spots in the leaves are killed in some other way, the other fungi are able to grow upon the dead spots as *saprophytes*. The one fungus which has been found to cause leaf-spot is the same one which causes a rot of the fruit known as "black rot" and also causes one form of *canker* on the branches. The fact that a single fungus is able to cause disease of leaves, fruit, and wood throws some light on methods of treatment. An old tree which has a large number of cankers on its branches caused by the black rot fungus is almost certain to show a large amount of leaf-spot, and of decayed fruit. The best treatment in such a case is to remove the source of infection by cutting out and burning the dead wood upon which the fungus is fruiting. This followed by thorough spraying should control the leaf-spot and the decay of the fruit.

Another line of investigation which has been carried on is in determining the number of fungi which we have in Maine which are capable of causing diseases of the wood which are usually



called *canker*. In this work it has been necessary to isolate fungi in pure culture and then to inoculate trees in such a manner and in such number as to insure that the interpretation of the results was correct.

There can be no question that much of what the orchardists of Maine are now calling *canker* had its origin in winter killing. The fungi which cause disease of the bark and wood are very rarely able to enter through uninjured bark. The bark killed by cold gives just as good an opportunity for a fungus to enter as a wound made in any other way. But whatever the origin of the trouble may have been, it is necessary to try to check the spread of that part of it which is caused by parasitic fungi. This may be done to a considerable extent by removing and burning dead branches on which the fungi occur. In the case of branches which show injured regions much may be done by carefully removing the dead bark and the part of the wood which is injured, disinfecting thoroughly with copper sulphate solution, and then painting over with white lead in oil. The main thing to keep in mind is the destruction of the living fungous material which is capable of spreading infection wherever wounds occur. *It is not enough that the diseased branches be removed from the tree. They must be burned to destroy the fungus because in many cases fungi are able to grow and produce millions of spores on wood which has been removed from the tree.* When the orchardist realizes that the fungi which cause the diseases of his trees are living plants which are able to grow and reproduce he is better able to understand the reasons for taking certain measures to prevent the spread of fungous diseases.

So far in our work we have found that what is usually called canker of apple branches in Maine is due to only two general causes. One is injuries due to weather conditions of which winter-killing is the main one, the other is attacks of parasitic fungi of which there are at least 4 in the State which are known to do considerable damage and there may be others. We have not found any case in which we considered that canker was caused by the organism which causes fire blight of the pear. It is well known that this organism causes disease of apple trees but we have not found it in Maine either on pears or apples,

although we have searched for it in widely separated localities. However, the fact that we have not found this disease does not necessarily mean that it does not occur.

The black-rot fungus, *Sphaecopsis malorum* Pk, which is very common here and is known to cause canker in other states has been tested as to its effect on apple trees under Maine conditions and has been found capable of doing great damage as it spreads and kills the bark of regions several inches in length in one season. The results with this fungus have been of value also for use in comparison with some other fungi which have been studied which have not been reported as causing disease in other places.

The bitter-rot fungus, *Glomorella fructigena* (Clinton) Sacc. has been found in Maine for the first time. First in a decaying apple which Professor Gardner secured at the Pomological meeting last year and later from both apples and cankers from an orchard in Oono. This fungus which does so much damage in some of the great apple growing regions has not been found to do very much damage here so far as we have been able to determine. There are two forms of the fungus, northern and southern, which in some of their characters are quite distinct and it seems from our study that the northern form is not so active a parasite as the southern form.

Besides these two which are usually regarded as the chief fungi which cause canker, in the eastern part of the United States, 8 other fungi have been used in making inoculations. In making these inoculations small incisions have been made in the branches of apple trees with a sterilized knife and then material of the fungus from pure cultures has been placed in the incisions.

If the fungus which is used in making the inoculations is a parasite, the mycelium grows and spreads rather rapidly, killing the bark and in some cases girdling and killing the branch. The bitter rot fungus and the black rot fungus are capable of killing small branches in 3 or 4 weeks and may kill large branches in a longer time.

Of the other 8 fungi with which I have inoculated apple trees during the past summer 2 have been found to be parasites. When branches of young apple trees or small branches of large trees, are inoculated with either of these fungi, the fungus

spreads into the uninjured bark and in a few weeks may kill a region 1 to 3 inches in length. In some cases the branch is entirely girdled and the part above the inoculation is killed. These two fungi begin to fruit on the dead bark in 3 or 4 weeks after a branch is inoculated and produce spores in great numbers which are capable of causing disease of other branches in case they are carried to wounds.

These two fungi are of special interest to Maine apple growers because this is the first time that they have been proved to be able to cause disease. They may cause disease in other parts of the United States or they may not. It may be possible that conditions here favor their development and that they are not capable of causing disease under other conditions.

One of these is of importance because it causes an apple rot which has never been reported before so far as I can determine. This fungus causes almost as rapid a decay as the black-rot fungus.

As we have seen, we have in Maine at least 4 fungi which can cause canker. Three of these are causes of decay of fruit. Every dead branch on trees in your orchard or on old neglected trees along the road may produce millions of spores of these fungi in a season. These spores may be carried to wounds on living branches by wind, water, insects, or by man himself, and there cause disease. The spores which have developed on the dead wood are present also when the fruit matures and in many cases the fungi which grow on dead apple wood are able to cause decay of the fruit. There are a number of fungi which grow on the dead wood in the summer as *saprophytes* which would do no damage if it were not for the fact that they are present in the fall and are ready to find entrance to the fruit and may do very great damage.

When we understand that most of the fungi which cause canker also cause decay of fruit and that several other fungi grow on dead wood which also cause decay, we can understand the importance of removing and burning all dead wood. If there is one point which needs emphasis it is this one. It is a common thing to see old neglected trees along the road or in old fields. If these trees are not of enough value to justify you in giving them the same care which you give the trees in your orchard, you should cut them down and burn them as a pro-

tection not only to yourself but to your neighbors who are trying to protect their trees from disease. One old diseased tree is capable of producing enough fungus spores to infect all the trees in an orchard provided they are carried to injured places on the trees. At the present time there is much dead wood in the orchards of Maine. There is no other one thing unless it is spraying which is so important in controlling the fungous diseases of the apple as the prompt removal and burning of dead and diseased wood. In removing dead branches, care should be taken to cut back to the living wood in order to remove all of the fungus mycelium, because if any remains it will continue to grow and will spread the disease. This care in removing the source of the material for infection should be followed by thorough spraying. Spraying of apple orchards in Maine is not nearly so generally practised as it should be, although it has been demonstrated many times that it pays.

I have already mentioned a number of the fungi which cause apple rots. It is a fact too well known to all of you that apples sometimes rot on the trees and that when they are placed in ordinary storage there is great loss. It is not so well understood, I think, that most of this loss is caused by the attacks of fungi. When we understand that this decay of ripe apples is caused by living growing plants which are able to propagate themselves in such a way that one rotten apple may produce enough spores to infect all the apples in a barrel, we are better able to make plans to prevent this loss.

During the past year, I have studied the fungi which cause decay of apples in Maine. The work along this line is not completed but enough has been done so that I can say that Maine has a large number of apple rot fungi. In this work we have found practically all of the fungi which cause decay of apples in other parts of the United States or in Europe and some others which have not been reported in either country. One fungus has been found which was described for the first time as a cause of fruit decay in Europe a few years ago. This fungus causes a rapid decay of ripe apples and also causes decay of green fruit upon inoculation. It has not been reported from any other part of this country, but probably occurs. One other fungus has been isolated from decaying apples which belongs to a group of fungi never reported in America and this species is new, never having



been described from any country. This fungus does not cause much decay of apples but is mentioned as a matter of interest as showing that it is possible to find new and interesting things in this study.

One of the worst of our decay fungi is the black-rot fungus, *Sphaeropsis malorum* which I mentioned earlier as a cause of leaf-spot, canker, and decay. This fungus may cause decay of fruit either on the tree or in storage. I have seen trees on which practically the entire crop of fruit was destroyed by this fungus. In some cases the spores of the fungus may be either on the stem or calyx end of the apple and when the apple is placed in storage if the temperature is not so low as to prevent growth, the fungus begins to grow and causes a rather rapid decay of the fruit. On October 5, 1909, I purchased 12 Rolfe apples from a grocery in Orono and placed them in glass jars in the laboratory. Within 3 weeks all but one of these apples had decayed, the cause being the black-rot fungus. In each case the fungus entered at the stem end.

Another bad decay fungus is the ordinary blue mold. This fungus, however, is not able to do much damage to uninjured apples. It must enter in most cases through a wound of some kind, it may be through an insect or fungous injury or it may be through a bruise or cut which has resulted from careless handling. The blue mold fungus is a very common saprophyte. It will grow on almost any dead organic matter. It may be seen on jelly glasses, on old bread, even on old leather. The spores are practically everywhere present and are ready to fall into or upon injured places on apples where they begin to grow and cause decay. This fungus causes a great part of the soft rots of apples in storage.

Another fungus which is a very common saprophyte and which does not do much damage under ordinary conditions, causes pink rot when the conditions for its development are favorable. This fungus usually enters at places injured by apple scab. Here we see that if the scab were prevented by proper spraying the pink rot fungus would not be able to do much damage.

The bitter rot is present in Maine but has not been found to be common.

The fungus which causes brown rot of the peach and plum has been found as a cause of apple decay.

At least 12 fungi have been found in Maine which are capable of causing more or less rot of apples. The rots caused by part of these fungi have no common names. It may be that in some cases the damage done by them is credited to some of the other better known fungi, as it is sometimes difficult to determine just what fungi are present without making cultures.

To prevent loss of fruit from these causes it is necessary to raise good apples which are free from insect or fungous injuries through which decay fungi may enter. To do this requires that the orchardist give careful attention to all the details of good orchard management, including thorough spraying. Care must be taken in picking and handling the fruit to prevent bruises and cuts through which fungi may enter. Any decayed fruit should be carefully sorted out at the time of storing, as one diseased apple may produce enough fungus spores to infect hundreds of apples if the conditions are favorable.

In closing this paper, it may be well to point out that while we have in this State a large number of fungi which cause apple diseases it is not necessary in most cases to give special treatment for each disease but that the treatment which answers for one will in a large measure control the others. For example, thorough spraying to prevent apple scab will at the same time control the fungus which causes apple leaf-spot and indirectly if there is no scab there is little possibility of decay by the pink rot fungus. The importance, however, of keeping up a constant fight against fungous diseases cannot be over-emphasized.

The Department of Plant Pathology of the Experiment Station is preparing a bulletin on apple diseases which we hope to issue before another season in which the diseases of the apple as they occur in Maine will be described with practical directions for their control.

## STARTING THE ORCHARD.

E. CYRUS MILLER, Haydenville, Mass.

*Ladies and Gentlemen:*

I have come a long distance to see you. I have enjoyed being here; I have enjoyed the people, and the beauty of your country; but I really came down here to bring you a message. You remember the little story that was so much in vogue a few years ago, the message to Garcia, that had such a wonderful circulation. It was a simple story, but still a story of wonderful truth. It was a story of taking a message to Garcia, in Cuba, and the adventures of the one who took it, showing the spirit of the man who took the message.

I believe I have a message for you here today. I have a message for every farmer and for everyone that is interested in agriculture in New England. I have been preaching this for years, and I believe I have this to do, and so I have come down here today to give you the best that is within me, out of my years of experience in establishing an orchard and studying the problems that underlie it, and its different phases. I have come down here to try to be helpful to you, and ask you now to just give me a few moments of your time.

I have brought with me a few photographs which I shall now take the liberty to start in circulation, and which will give you an idea of some of the points on which I propose to touch.

I have spoken about the charm of the people and the beauty of your scenery. Yesterday, instead of attending your meetings here, I wandered away over the fields to visit and enjoy the hospitality of one of your most successful and prominent fruit growers. And I want to assure you it was a most delightful day to me, a day of pleasure, and also a day that widened and broadened my experience, as far as understanding the natural conditions as they exist in your state, as applied to the growing of the apple.

My good friends, you do not comprehend the wealth of these hillsides that are spread out over your beautiful State of Maine. I wish you might see how those naked fields might be clothed

with orchards, not only beautifying your landscape, but becoming a source of profit to the individual owners, and adding fame to your already glorious state. There is no crop, with perhaps the exception of the hay crop, which can be more generally and successfully grown in the State of Maine than the apple. It is your most permanent asset, next to the hay crop.

The other evening, through the slides thrown upon the screen, I showed you something in regard to the renovation of old orchards. That is a necessary step—the care of the orchards that you already have. But I shall assume that you are going to do something for them, that you are going to wake up, take a new lease of life and do something for those old trees that have been started by the wayside and in the fence corners, and still live, and give you some apples every fall. The apple crop brings in hundreds and thousands of dollars and I shall assume that you will take care of the trees you already have.

Now how about starting the young orchard? I presume that I am talking to three classes of listeners here today. There are first the farmers and fruit growers, in which class I am. I am a farmer, and am simply making a specialty of the growing of the apple. Then there are the business men here, who may desire to take up the growing of the apple as a business proposition. I find that class of people greatly increasing throughout New England. I have a great number of clients whom I am serving in helping establish orchards and get things into business shape, because they realize that sometime they want to leave their business or their profession, and they want some place to go, and it seems to be their choice to establish an orchard and so provide for the future. And I am glad to see that class of people increasing. It is a gratifying sign for the uplifting of agricultural conditions in New England, because that class, as a rule, bring to their work and into this life methods which they have followed, and habits which they have acquired, which among our farming people are perhaps too many times lacking. Then again, there is the class which I may call the capitalist. I long for the day when capital may become interested in agricultural projects in New England, and when capitalists may take hold of these things and conduct them as our manufacturing establishments and our large banking establishments are conducted—along business lines. I long for the time when the



capital that is made here on the farms and in business shall be invested here, and not sent west. I know of hundreds and thousands of dollars that have been sent out of New England to develop these western countries. The bank treasurer in your village told me that if the money that had been sent out of this little town alone could be calculated, any man possessing that would be the wealthiest man in the section. I have talked with bank men about these things, and know that an immense amount of money has been sent out of New England into all kinds of schemes, and the owner has frequently been fortunate if he has received back a very small proportion of the original amount he sent out. These are the three classes of people I am going to assume to be here, which I think will be interested in starting the orchard.

Now regarding the choosing of the varieties. This may seem a rather delicate matter for a Massachusetts man to come down here and talk to you about. But I think you will agree with me on one point, and that is that the number of varieties should be few and well chosen; chosen according to your location and according to your markets. If you are growing them for home use, that is one thing. You can have a succession of fruit that will supply yourself and your friends and your immediate markets throughout the season. But if it is a matter of commercial variety, just tie up to two, three, four or five kinds. On seventy-five acres planted, I have nothing but the Baldwin at present. The Wealthy is my second choice. I do not say this to influence you here in Maine, but my own individual choice has been narrowed down to two varieties. A red apple, if we are to decide by the color, is the most desirable apple. We know that the great majority of apples that are called for today in restaurants and stores and fruit stands everywhere are red apples. As beautiful as the yellow and white apples may be to look at, as luscious as they may be to eat, it is the red apple that sells. And we want to grow the apple that is going to sell the best, and of which we can sell the largest quantities.

I believe that in the long run the Ben Davis, if well grown and properly handled, may become and may be continued as one of our most important commercial apples. But I will simply say just this one thing, and that is, if you do grow it, grow it well. Grow it as well as Bro. Cummings grows it, which

is good enough for anybody. He needn't be ashamed to put up a box of his Ben Davis apples and send them to the King and Queen of England, or the President of the United States. But he should put a ticket in them telling when to eat them—not before Thanksgiving or Christmas, but next spring, next summer perhaps.

There are half a dozen leading varieties,—the Baldwins, the Northern Spy, the Wealthy, the Greening if you will, but don't get in too many kinds.

There are three kinds of land which we can utilize for orchards. There is the best land on our farm, by which I mean the land that has been tilled, and is in good heart, and which may be the best suited at the time being for an orchard. Then there is the wild land, such as pastures, where the land has been partly cleared, and has more or less fertility. The third class is the forest land.

I am going to advise you first to take your best lands. Now I suppose you will call me right down on that, some of you good farmers here who think a great deal of nice slopes and well-tilled fields. But I want to tell you this,—that there is no acre of land that you have on your farm, however good your tilled land is, that will compare in results with an orchard. I have an orchard which has been planted twenty years, and ever since it was ten years old it has been yielding five or six per cent on a thousand dollars an acre. Now I don't say that to bring myself into the matter, but I simply want to call attention to the value that you can give to your land by putting trees on to it.

You can talk with any of your banking men, and let them tell you how much more money they will loan on your farm if you have apple trees planted on it, if they have any experience in this line. Of course I do not mean to say that if your best lands are low lands, running beside creeks, with clay soil, you should set apple trees on them. But you have enough good land. Some part of the average farm here in Maine is usually suited for growing apples. Of course you must consider that the uplands, the hillsides, or even the hilltops, are most desirable. We find on those locations usually between a light loam and a heavy loam; and in the long run that medium loam is the best suited for the growing of the apple. Then of course the better location you have as far as protection from the winds of the west and

north the better. Our friend, Bro. Cummings, has the most ideal location, or one of the most ideal, that I ever saw. We have a location in Massachusetts, Apple Valley, that is similar to it. Where the land lies up against the hills and mountains that protect it on the north and west, where the orchards get the full benefit of the sunshine, which is especially desirable along through the late summer and early fall in ripening up the fruit and putting on that beautiful finishing touch, it is one of the greatest things in the world. But that is not material. Select your best soil, and as far as you may, the upland soil which is well drained, both by natural and atmospheric drainage.

Now as to the nursery stock. I don't know about the condition of your nurseries in the State of Maine, but I do believe it is a grand opening for any one to establish nurseries here and grow trees; and to grow good trees and charge a good price for them, because they are worth a good price. It is a well-known fact in horticulture that plants and shrubs thrive best in the section where they are grown, and I believe that is true in regard to apple trees. Certainly get your stock, as far as you can, from the same latitude. Don't go south for your apple trees, because you will be pretty apt to find that unless you keep them growing thriftily and vigorously, they will have black hearts and deteriorate. Buy of a good nursery house, specify what you wish, be willing to pay for it, and buy good two-year-old trees, if it is possible to obtain them. If it is impossible to get them and you are all ready to plant, you may possibly accept the one-year-old trees. I know there is a difference of opinion about that. But from my own experience and talking with the best nursery houses, I am thoroughly convinced that a two-year-old tree is the best tree to set that we can get from the nursery, to transplant in a way that there will be the least possible break in its growth. We might take a young tree, a yearling tree we will say, and perhaps train it more to our ideas; still, by getting two-year-old trees we gain a year's time. We buy a year's time in the growth of the tree for usually about ten cents, and I consider it a poor business proposition to get a one-year-old tree and take the difference in size for the sake of saving ten cents.

Now I am in the apple business for two reasons. Primarily, because I love it. In the second place I am in it to make money,

and I propose to make money, and propose to make money through recognizing all these details which to many people may seem unreasonable and of no great importance.

Now about preparing the land, and what crops to grow in the young orchard. You are a good class of farmers here. I know that by looking into your faces. How do you prepare your land for the ordinary hoed crop? You prepare it by plowing and giving it a good dressing of fertilizer, and giving it a good harrowing. And those of you who grow the best crops are those that give the greatest attention to the preparing of the soil. That is a well-recognized fact in agriculture. The men who are growing the best crops today in any line whatever are those that pay the greatest amount of attention to the preparation of what we might call the seed bed. And what does it mean? It simply means that we are providing an environment where the plant is able to get hold of the plant food. That is just what we want to do in regard to the apple. We just want to fix that soil so that the mass of fibrous roots that come to us from the nursery, when we place them in the ground will be able to get hold of the plant food in the soil. And unless we do prepare the soil in some such way as that, we are going to get a stunted tree. And when we get a stunted tree, we get a poor tree and become discouraged apple growers.

Now the only way to continue our interest in this young orchard is to get a good healthy tree and plant it in soil that is well prepared so that it will start to grow and continue to grow.

And, by the way, I do not advocate to farmers and business men large operations. I say go slow. Learn the business. Begin at the bottom, even if you have got an ordinarily large orchard established. Start your young orchard in a small way and take good care of it, and let it be a source of inspiration to you to take better care of it every year and put out more trees. If you put out an acre this year and take care of it, it will be pretty safe to assume that you will put out another acre next year, and in a very few years you will have an orchard that is large enough for you. With the capitalist it is an entirely different proposition. Your capitalists, in the corporate form of management, can put out just as many acres as they have the capital and the ability to manage.



Now as to the crops to grow. You can grow any hoed crop to good advantage, like corn, potatoes and market vegetables. Even asparagus and small fruits come in to good advantage, the strawberry, the raspberry, the blackberry, and the currant. If you want to utilize those crops to help pay your bills as you go along it is a perfectly legitimate proposition. In our own operations I have used the regular farm crops, like potatoes and corn, and a portion of the time tobacco, because we are just on the edge of the tobacco belt. Market vegetables, like cabbage and tomatoes, are good, and the more intensively you grow them, the better your orchards will be. The best block of trees I ever grew was a block that was started with tobacco, because there is no crop we grow in Massachusetts, or perhaps that is grown in New England, that calls for such intensive fertilization and such a large amount of stirring of the soil to continue the growth of the crop; and the more attention we give to the crop that is planted on the section the better the trees will grow.

Set the trees a good distance apart. Two great fundamental troubles have been in the past, in orcharding in New England, that the trees have been planted too close together, and too many varieties have been planted. We can now realize by glancing around us and seeing the mistakes that have been made in the past, how important it is to set our trees so that we may allow such a growth as they are to make. Of course thirty or forty feet seems a long distance apart to plant trees no larger than your finger or thumb. But we know by experience that a few years brings a great change in the appearance of the tree, and we know that if we are to succeed in the largest measure, our trees must have ample space in which to expand and develop.

I think the best plan in establishing an orchard today, where we desire to utilize the largest amount of the surface of the land possible, is to plant some standard variety for a permanent tree, a Baldwin, or a Spy, or a Greening, and interplant with some smaller growing variety which bears earlier than our standard varieties do; and when the standards come to that estate when they need the entire area of land, simply cut out the other trees. Many an orchard has been planted with the idea of cutting out every other tree when they encroached upon each other, but it is very rarely that that has been done in the past. I think

this will be more likely to be done if we utilize a different type of tree, and plant it with the definite idea that when the time comes those trees are coming out.

The distance apart our standard trees are planted is forty feet between the rows, and thirty-five feet in the row. If planted with some other variety, it would be thirty feet in the row and thirty-five feet between the rows. That form of planting will as a usual thing give the trees ample space for at least a generation.

Plant the trees carefully and head them back when you plant them. Let us try to change the form of our tall trees to the more modern, low headed type. In order to do that we must get a reasonably low-headed tree in the first place; not too low, but if you take my judgment you will get an average tree headed about three or three and a half feet high for a standard tree. It is necessary to get a certain length of stem to your tree if you are to have a tree of good bearing capacity; and you all know that you cannot get a good class of apples unless you have a tree that is capable of producing them. So I say get a stem of moderate height, so when your tree comes to its proper size you will have a tree of good bearing capacity.

When the trees are planted, my idea in regard to the pruning of them is to prune each little branch back to within about two or three buds of the parent stem, leaving those buds in a way that they may make a frame work in the air. If you don't you will get something away up in the air, unless you cut it off, and the best time to cut it off is when it is young. Just build a frame work around an open center. Sometimes you find a tree in bad shape, and it is pretty difficult to do this, but with the average nursery tree and the average variety you can do it.

See that the tree makes a good growth the first year. That gives you a chance to head it back again, heading back about half or one-third of the growth that it has made that year, and continuing that heading back as long as you can reach the branches. It gives a more compact, solid form of a tree. It is a better business type of a tree and after it begins to bear and spread, the shape of the tree will always be so that it will help you in all your operations. I do not care how old it may be, I do not want a tree that will require more than a twenty foot

ladder to pick the apples. With a tree like that the time can be reduced one-half or more, as compared with one of the high trees.

Ques. Do you cut back those trees in the spring or fall?

Ans. In the late winter or early spring. In fact, I do all my pruning at that time, before the sap starts, or about the time it does start, unless there is some special reason for not doing so. I do not believe in summer pruning. You know the best time to cut out brush in the pastures is in the summer, because it devitalizes the roots in the plant. That is just the idea. When we trim our apple trees in the summer it devitalizes that plant, and unless there is some special reason for it, unless it is a tree that is over vigorous, we should not do this. And we all know the average New England apple tree isn't over vigorous. Prune in the spring, or just before the sap starts, and it will get over it much quicker than if pruned later.

In regard to spraying: Some may think it isn't necessary to spray a young tree, but it is certainly necessary to spray it for one thing, or for one class of troubles. I suppose you have all heard of the San José scale, although Prof. Hitchings says there is but one case of it in Maine. Now this San José scale is a hard proposition. In southern New England it has increased more rapidly this year than any year I have known. If you are to keep it out of your state you must watch out, that is all there is to it. We talk about climatic conditions and all those things. I do not believe, personally, that climatic conditions will keep it from your State. But you can do a great deal to help control it. In the first place, I believe that when you plant your trees or before you plant your trees you should dip every one of them in a mixture that will be sufficient to kill every scale on the tree, if there happens to be any. That is my rule. I use Scalecide and sulphur of lime. The one is what is called an oil solution; the other is a lime and sulphur spray which is advocated by our entomologists, and is used perhaps more than any other form of mixture. Either one will be effectual. Take a barrel of the mixture and treat your trees before you set them. Dip the trees into the barrel away down to the roots, and by so doing you give those trees the most thorough spraying they can possibly have, and they start right, and have received protection for that year. After that I advise

an annual spraying with one of these two mixtures. It is good for the San José scale; it is good for the oyster-shell scale, which I know you have. It is good for every scale. It is good for all forms of disfigurement and discoloration on a tree. It makes the trees look healthy and vigorous. After you have done it once, if you have got an interest in the business you will not omit it. It adds much to the vigor of the tree, besides insuring the control of all these insect pests. We have an immense number of insect and fungous pests, and we should get right after them from the start.

I want to say just a word about the borer, because that is an insect that begins to trouble us after the first two years, and probably does more injury to the young apple orchard in New England than any other one thing. The best way, in my opinion, to get the best of the borer is just to keep after him all the time. Make periodical rounds through your orchard and among your trees, and just the minute you see any signs of the borer working, which is manifest by the throwing out of little chips, simply take your pruning knife or pen knife and cut into that tree, and if you are there quick enough you can very easily remove the borer. While there are a great many proprietary remedies suggested for applying to trees, do not experiment with any of them. Get busy with your knife and dig out the insects, if you have any. And if you give your trees clean cultivation you are not going to have very much trouble with them.

Young trees should have, in my opinion, three years at least of cultivation. Then if you desire to make a quick rotation of oats and grass, oats the first year and grass the second, and then back to some hoed crop, I don't know as your orchard will be materially injured or the growth stopped. But remember always to learn to read your tree. See what those trees are saying to you every day in the year. There is no absolute rule in horticulture. It is the man behind the method that brings success. I will not quarrel with any man, whatever his method is, if he will show me results. All I am trying to do here today is to make suggestions along certain lines. If they do not appeal to you, do not accept them. But do something. Do not plant your trees and go away and forget them. You will never get profitable returns in that way. You will never get



trees that will be admired by yourself or your neighbors by any such treatment as that. You have got to do something to them all the time, and they will tell you what they want. If the leaves are yellow, they need some nitrogenous fertilization. You want a good, dark, healthy, green foliage, and a good healthy growth, varying from six to eight inches in a tree. You do not want to make that growth too late in the fall, because your climate is liable to be severe and they are liable to winter-kill.

There are two fundamental causes for winter-killing, one is the starving of your trees to death, and the other is giving them so much food that they have not ripened the wood so they can go into the winter in good condition. Remember those things.

Of course when your trees get old enough to bear, you want to put on a spraying mixture for insects and fungous pests. There are two classes of spraying mixtures for these. One is what is called Bordeaux, which is for fungous troubles such as Dr. Lewis told you about. The other is Paris green and arsenate of lead, for the chewing insects. Then there is still another proprietary remedy that has just come out, called Sulfocide. It is claimed that a great deal of Bordeaux will injure the fruit and foliage. This Sulfocide is supposed to take the place of it, and I believe it is a very promising thing. I did not however, come here to exploit any proprietary medicine.

Spraying is easy to do when you come to a realization of the purpose for which you are doing it, and the benefit you are going to get out of it. It should be thoroughly done.

Question. When would you spray?

Answer: My own personal opinion is that the trees should be sprayed thoroughly with Bordeaux or some other fungicide, and arsenate of lead, immediately after the blossoms fall. I believe there will be very little reason for a second spraying, but still, if any one desires to still further protect the fruit, it is perfectly feasible to spray a second time, from three to five weeks after.

Question. How do you protect the trees from mice?

Answer: We protect the trees from the very start, by putting a strip of either tin or very fine wire around them. Mice are the next serious pest to the borer.

Question. How about tarred paper?

Answer: That is all right, if you do not put it too close to the tree. If you do it is liable to kill the tree.

REMARKS BY D. H. KNOWLTON,  
Farmington, Maine.

*Mr. President, Ladies and Gentlemen:*

I can assure you it is a special pleasure for me to be with you here tonight. I was very sorry that I was unable to be present with you last night at the banquet. I have had a special interest in that banquet. I think it was largely through my influence, while I was secretary of the society, that it was instituted. I regretted very much that we did not have something of that kind last year, because I think there is nothing that will bring a lot of fruit growers together in a better frame of mind than a good banquet, and I hope that your successors in office may continue that practice.

I have been very much interested in your program, and I wish to congratulate the retiring officers upon its excellence. Mr. Wheeler's talk was particularly enjoyable. I am reminded in hearing him and seeing him of a visit which I made in the vicinity of his home some ten or a dozen years ago. I think it was on that occasion that I got my first real impression of the possibilities of the New England soil. We went out to the home of Mr. Samuel Hartley, who then lived in the town of Lincoln. He had one hundred acres of land, in tillage and in pasturage, etc. And he was, it seemed to me, a very skillful operator. From that one hundred acres of land he had stored in his barn, in the month of October, one hundred and twenty-five tons of hay. He had two heavy teams, weighing nearly 1500 each,—very large horses. Well, he told me that commencing with the first of May he had sent five two-horse loads of produce from his farm to the city of Boston up to the middle of October. When I was there he was at work conveying to the city 1200 barrels of apples which he had in storage; all from that one hundred acres of land. I was surprised. And, as I say, it was the first real idea I ever had of the possibilities of New England soil. The conditions here in the State of Maine, it seems to me, are quite the equal of that.

In the month of July, I had the pleasure of visiting for a day and a half Benton Harbor in the State of Michigan, a point

through which, as you may know, a larger part of the fruit product of the State of Michigan goes to market. I was interested in everything I saw there, and I studied the situation with the keenest delight. Everywhere the land seemed to be appropriated either to some kind of fruit growing or some market garden truck. Acres and acres of grapes were spread out before me, and as I stood on an elevated place at one time it seemed to me I could see more than a thousand acres of grape vines. I met one man there who had been a railroad engineer all his life. His wife thought he had been in the business long enough. She wanted to get her children away from the associations by which they were surrounded, and she prevailed upon him to give up his work on the railroad and go to Benton Harbor and purchase a farm. He purchased a twenty acre fruit farm in Benton Harbor, for which he paid in cash the sum of \$10,500. That is how much a fruit farm is worth on the shores of Lake Michigan.

Now in my county, in the town of Temple is an orchard which I think is one of the best orchards in the State of Maine, of its size. This year the owner of that orchard has harvested about 1200 barrels of apples. Within sight of that farm, almost, there are thousands and thousands of acres of land that are just as good as his. I don't know but the land is just as good as it is in Benton Harbor. It can be bought for from \$5.00 to \$10.00 an acre.

So much has been said about the possibilities of fruit growing in Maine that I feel like calling attention to this and drawing the contrast. Now at Benton Harbor the price of fruit was remarkably low. I didn't see how they could grow strawberries as cheaply as they sold them and make anything on them. I didn't see how they could grow raspberries and cherries and other fruit so they could make anything out of them. But they told me when they got around to the close of the year they found that a good balance was in their favor all the time, because there was always a ready market for everything they could produce and get started for the city of Chicago. I believe there are many opportunities for doing a similar work here in the State of Maine.

The difficulties in the growing of fruit are very great, but these difficulties, or similar difficulties, are peculiar to success

in all the walks of life. Sometimes I think they seem greater than ever. The insect hosts seem to multiply, and the fungous diseases, etc. Our fungous troubles seem to be greater than ever, but it is one of the pleasures which we have in this life to overcome difficulties individually, yet we have all the scientific equipment necessary at the Experiment Station to aid us in carrying on this work, and they are always ready to assist us. Sometimes I blame the fruit growers for not intelligently studying and assimilating, if I may use that word, the instruction which they receive.

My occasion for speaking of this is that I very well remember the first exposition which we had of spraying, or the principle of spraying, and the results of spraying in the State of Maine. I think the first talk offered in the State of Maine anywhere, was that given at Bangor years ago by Mr. Samuel C. Harlow. You remember who were there. You remember the condition of the fruit which he showed upon the exhibition table. It was the best lot of fruit there was upon the table by far, because it was the most free from insects, scab, etc., no doubt largely or entirely due to the results of his spraying. From that time up to the present, in one form or another, we have kept this subject before the fruit growers of the State, and I am chagrined to see, Mr. President, that so few have taken advantage of what was certainly all in their favor.

Then there is another trouble. We go to the Experiment Station sometimes and seek advice from them. We get the advice but we do not understand it. We do not get hold of it, and we go to work and do the thing just wrong, and then out comes an outcry against just the thing they have been teaching there at the Experiment Station, and what practical men know to be true. At Benton Harbor I was reminded of this in a very forcible way, because there was a man who had an orchard of two or three hundred Moore's Arctic plums. The trees were beautiful trees. They were heavily loaded with fruit too, and the proprietor said he would like to have me come over and look at his fruit trees. He would like to know what the trouble was. I went over with a good deal of interest to look at them, and when I got there I found upon those trees there was hardly a single plum but that had suffered injury from some cause. I asked him what he had done for the trees during the year, and he said



he had given them a good spraying. He certainly had given them too much spraying, because every plum showed the effects of the spray upon it. It was too strong, or there was some difficulty with the spraying. I told him I thought, if he would send his fruit up to the Experiment Station and let them pronounce upon it they would tell him next time to be a little more careful in spraying.

Well, that isn't true alone of fruit growers. After we came home I stopped over Sunday with my son in Massachusetts, and I found that in quite a large section of that village certain kinds of trees had been nearly ruined by spraying. They had sprayed the trees to destroy the caterpillar, and they not only destroyed the caterpillar but they had well nigh destroyed the foliage upon those trees. I felt particularly ashamed in Massachusetts, because somehow I supposed that those men were doing the thing scientifically, as they claim to do most things in Massachusetts:

Question. What had they sprayed with?

Answer. I don't know. I didn't investigate. But I noticed the condition of the trees. There was some trouble there. So in following the advice of the Experiment Station, you should be careful to do the work right.

Today the Pomological Society has made a change of management, or at any rate has elected new officers for its two principal positions, and I wish to congratulate the new officers upon the promotion which has been conferred upon them. I wish to congratulate them also on the grand opportunities for work which they have before them.

I hope that you may take hold one and all and join with them in carrying forward the work of this society. The profits from fruit growing have not been touched upon here in the State of Maine. You don't know what possibilities there are before you, if you will develop this industry. But it is with you to do it, and you will need to work with all the aids there are. There are several of those. There is the Experiment Station, the Agricultural Department, and you have your own society to carry it forward. Then again there is a strong sentiment all through the State and all through the country in favor of incorporating the teaching of agriculture in the schools. And one of the nice things you did today, was to get in the school of Norway.

I wish we might do that on all occasions of this kind, and that an interesting feature of the program might be specially arranged for them.

There are two things more to which I feel like calling attention. The first is in regard to the varieties of fruit to plant. Now while I wouldn't tell you just exactly what varieties to plant, because I don't know what your situations may be, it does seem to me that in view of the shortness of the season you should plant more marketable varieties than you are disposed to plant at the present time. Now don't take my meaning to be that I advise planting more varieties than are planted in the State, because I don't mean that at all. There are too many varieties already. But what I mean is that for market purposes you shouldn't plant all Ben Davis, nor all Baldwins, nor all Northern Spies. If I could have a large orchard just to suit me and make orcharding my business in the State of Maine, I would plant some Duchess of Oldenburg, and then I would plant some Wealthies, and so on. In other words, I would plant varieties so that instead of waiting until the first of October, when the cold weather is right upon you, you could begin harvesting your fruit by the first of September. And if you can get a hundred barrels of apples, or two hundred barrels, into market before the first of September, or even more than that, you have got them out of the way of the frost anyway. You can pick fruit to better advantage then. The weather is warmer, the days are longer, and you can get more of it into the market. That is one thing, it seems to me, with the short season we have, which we ought to do. This year in my county, if the season had been as it was two years ago, the farmers wouldn't have been able to pick one-half their apples. Fortunately, the season was very mild, and the mild weather was extended over weeks, so they had no trouble in getting their fruit all in. But that is a trouble that is likely to come up every year. If you can't get \$3.00 for your apples, per barrel, in the month of September, you can raise them at a profit and get them into the market for \$1.50, when you don't have to store them. Perhaps you can get more than that. So I advise planting more marketable varieties and not so many of one or two or three kinds of the latest varieties in apples.

Now there is another thing which comes up and stares the fruit growers of this state in the face as one of the serious problems to be considered, and that is the matter of greater storage capacity. In my part of the State there are scores of farmers who, in an ordinary year, when fruit is abundant, cannot take care of it after they get it picked. They have to sell it. They have to get rid of it for just what they can get. The result is that they injure all the other fruit growers in the State, because it reduces the price by the quantity of fruit that is thrown upon the market before it is ready to be sold. Those matters I feel like briefly calling attention to. I am very glad to meet you and want you one and all to give the new officers of this society a better support than you have ever given the former officers. I assure you they will appreciate it, and I can assure you that their work in the State of Maine will be much more effective than it has been in the past. I think you.

### THE GYPSY MOTH.

By CAPT. E. E. PHILBROOK, Portland.  
(Stereopticon Lecture.)

*Ladies and Gentlemen:*

Before attempting to show you any of the pictures, I will try to give you a brief history of the gypsy moth work that has already been done.

The gypsy moth was first introduced into this country by one Louis Trouvelot, a French astronomer, who resided in the town of Medford, Mass. He imported from the old country some of the gypsy moth caterpillars, with the intention of crossing them with some of our native insects, in the hope of producing a silk-bearing caterpillar of commercial value. But by accident the caterpillars escaped and took to the woods of Medford, where they remained about twenty years before the work was taken up by the Massachusetts Department of Agriculture. The work was carried on for ten years, and at the end of that time the department had been so successful in their efforts to exterminate the gypsy moth that the politicians of the legislature decided that no more money was needed,—that there were no more

gypsy moths, and therefore the work stopped, and from 1898 until 1905 no work was done. In those few years the caterpillars had increased to such an extent that now Massachusetts has nearly two hundred towns infested with the gypsy moth.

In August, 1906, a gentleman at Kittery Point, Maine, took from his orchard what was supposed to be a gypsy moth. The same was sent to Prof. Hitchings at Augusta, and he immediately decided it was a gypsy moth. This fact was communicated to the department at Washington, and on the strength of that the government agent, Mr. D. M. Rogers, sent to the State of Maine, on the 20th of November, 1906, twelve men to scout the State for the gypsy moth. They came to Kittery, and continued along until they got to Biddeford, which was on the 28th of January, 1907. By this time the snow had become so deep and the weather was so cold that it was necessary to discontinue the work, which they did, going back to Massachusetts and returning on the 14th of April and remaining until the 4th of May.

They found during their scout, up to that time, 518 egg clusters of the gypsy moth in the towns of Kittery, York, Eliot, South Berwick, Wells, Kennebunk and Kennebunkport. In the meantime, the Department of Agriculture at Augusta, which had in its employ several young men, had sent them to Massachusetts to take up the work of the gypsy moth there, that they might be able to cope with the same in the State of Maine. They were placed on the government pay-roll, and after remaining there a month or so, were sent to this State to scout the cities and towns between Portland and Bangor, which they did. The only infestation which they found was at the Soldiers' Home at Togus, which has been fought for two years or more, and I am happy to say that the infestation there has been entirely wiped out.

Our appropriation, made by the legislature, had then become available, and nine men, or ten men I might say, consisting of myself and nine others, were hired for the work, and we began in earnest. Believing that something had been left behind by the government scouts, owing to the severe cold and storm, we were sent over the same territory that had been covered by them, with the result that 462 egg clusters were found in these various



towns. By that time the burlap season had come. We commenced burlapping, and burlapped 2121 trees in the different towns, which were attended very faithfully by the men during the summer, with the result that we secured some 30,000 caterpillars.

In the fall of that year scouting was again taken up with an increased force, both by the government and by the state, until at the end of the year we had fifty-two men on the force, part of them being government men, and part of them state men. We continued scouting through the winter, and about the middle of January we again increased the forces so we had seventy-five men. The scouting was continued until it came time for burlapping.

In the first of the year very severe infestations were found in the towns of Kittery and York. These were handled in the usual way, by the cleaning up of the trees and by the cleaning up of the ground, burning the ground over, and so when the spring came we were able to take up the work of burlapping and spraying. We burlapped 60,000 trees this year, and they were attended in the same manner as the 2121 of the year before, with the result that 77,850 caterpillars were taken from under the burlaps. In addition to this, millions of the caterpillars were destroyed by fire, in burning out the stone walls and burning over the ground and over places where refuse was to be found. We continued the scouting again in the fall of the year, carrying it along until the first of January, with the result of finding 16,228 egg clusters in this year. We had then expended our appropriation. Pending the matter of another appropriation by the state legislature, the government took up the men and the work was carried on through the months of January, February and March. The work has been carried on this year in a like manner, practically. In some places we have increased our use of lead arsenate. In the year 1908 we used 1728 pounds, and this year we have used over four tons. Over one hundred thousand trees have been burlapped and attended; and it is almost impossible to state the number, but the supposition is that at least 2,000,000 caterpillars have been destroyed in this year's work. The number of egg clusters found will not be known until we receive the history of the men in the field.

This is a brief history of the work that has been done in the State by our men. And right here I beg to say that in no kind of business anywhere has there been such a lot of men brought together. We have the most intelligent, the brightest and the most gentlemanly set of men engaged in the work that are hired by anybody. Every one of them is a native of the State of Maine. In our work in the last two and a half years we have had representatives from every county in the State on the pay roll. Every college in the State has been represented,—Bowdoin, Colby, Bates, University of Maine; also Hebron Academy, etc. This is the class of men which we have tried to hire and which we will continue to hire as long as we have charge of the work.

I have made a few slides which possibly may be of interest to you, which will show the character of the work and the process which is gone through by the men in the field. The first picture shows a woodland and an apple tree on the estate of John Thaxter at Kittery Point. This apple tree is the tree from which the first gypsy moth in the State of Maine was taken.

The next picture shows the first gypsy moth crew in the State, the original gypsy moth crew. They are all in the work at the present time with the exception of three, Mr. Hale, who is now in the Harvard Law School, Mr. Baker of Portland, who left the work to take a situation which pays him more money, and Mr. Hamilton of Norway, who was obliged to leave the work in July on account of his health.

This picture represents the method of putting the burlap on the trees. A strip eight inches wide is put on the tree and tied in the center with twine, and the upper part turned down. The gypsy moth caterpillar is a night feeder. During the sunshine of the day it comes down from the tops of the trees. This burlap is put on the trees so that this will be the first hiding place that it reaches. It goes up under this flap. The burlap is turned every day and sometimes twice a day, and the caterpillars taken out from underneath and crushed by the men.

The next picture shows the method of burlapping an apple tree on the limbs above the crevices, which keeps the caterpillars from going down and hiding in the crotch of the tree. This

is on the estate of John Thaxter of Kittery Point. This is what is known as one of the best government crews in the State, called in our work, "Soule's Government Crew."

The next slides show the scouting for egg clusters, thinning out of trees, the work in the underbrush, the method of burning out a wall with crude oil to destroy the caterpillars, and the work of turning the burlaps.

We now have an orchard on Gerrish Island, known as the Goodwin orchard. Here is one of the finest jobs in cleaning up an orchard which we have ever done. This is what is known as Pike's crew.

The next slide shows a gypsy moth infestation in a stone wall. It is no uncommon thing for the men to turn over 300 to 500 yards of stone wall, and then put it up again in the manner in which they found it.

This is what is known as the Farwell infestation in the town of York. These rocks were taken from the underpinning of the house. They were badly infested with the gypsy moth. The underpinning was all taken out and afterwards put back by the men.

We have here an infestation on the Haley place in the town of York. This tree marks the greatest number of gypsy moth egg clusters found in the State of Maine, in one place, there being 1,034 on this one tree.

Early in the year 1909 the men discovered on what was known as the Moulton place in the town of York a very serious infestation, under a pile of lumber. In this pile of lumber are 480,000 feet of boards, and nearly every board had more or less egg clusters on it, which necessitated handling over the entire pile. This is one of the worst infestations we have ever found. This lumber was destined to be sent to the State of Connecticut, and had it not been for our finding this infestation, that entire lot would have been shipped to Connecticut and there bred an infestation of the gypsy moth.

This shows the winter work in the woods, the cleaning up of the trees and the cutting out of the dead wood, and clearing away of the underbrush. These woods are around this pile of lumber we have just shown.

Another winter scene, 7.30 in the morning, showing the men just about to commence work scouting the apple trees. One

man is in an apple tree and another man on the ground is attempting to build a fire to keep warm.

The next picture that we will show is that of an infested tree that it was necessary to cut down. After cutting down the tree the wood was piled up. There were six and one-half cords of wood and nearly every stick of wood in the pile contained a gypsy moth cluster.

Our work has been visited several times during each year by Mr. Gilman, the Commissioner of Agriculture, and this picture shows Mr. Gilman in the field, and the inspectors pointing out to him the egg clusters of the gypsy moth.

This is what is known as the Bragdon orchard in the town of York. The slide shows the orchard before any burning or trimming had been done to it. The next picture shows the crew in the orchard trimming, and afterwards the trees were scraped and pruned in fine shape. Then we have a view of the spraying of the orchard by the barrel spray in the early spring, and another view of the barrel spray in action.

During our work in the town of York the people there were so satisfied with what we had done towards clearing the woods and orchards from the gypsy moth that they wished in some manner to show their appreciation, and several of the citizens of the town, with the help of the summer visitors, raised one thousand dollars with which they bought this spraying machine and turned it over to the Department of Agriculture, for their use in York. This machine has a four hundred gallon tank, a ten-horse power engine, and is one of the finest machines made in the world, and that is saying a great deal. It is known as the Woodland sprayer. The slide shows the machine spraying the woods in the town of York.

The next view is a woodland sprayer used in the streets of Newton, Mass., spraying a spruce tree 71 feet high. You notice the spray is being carried over the top of the tree. From 200 to 300 pounds pressure is used. I will also show you the same machine spraying in the woods in the town of Newton, with 1500 feet of hose. These slides were loaned me by the Frost Insecticide Company.

This finishes my slides, and I want to take this opportunity to thank the officers and members of the Pomological Society for the many courtesies which I have received here in the last two days. I feel very grateful to you all.



## GROWING AND MARKETING FRUIT.

By R. L. CUMMINGS, West Paris, Me.

*Mr. President, Ladies and Gentlemen:*

The subject I was asked to speak upon a few minutes tonight is the growing and marketing of fruit. By that we mean apples, of course, and I look at it from a commercial point of view, that is, as an investment for profit. And if we are going into any business for that purpose, we ought first to compare our qualifications with those of other people in the same business. Now if I said the apple is the leading fruit of the civilized world, I don't think anyone would dispute it. And if we were to compare the American apple with any other apple grown in the world, we should find it as the Englishman did when he was inquiring about the position of the yachts in the race for the cup. He asked who was first, and the observer said laconically that the American was first. "Well, who is second?" "Nobody." It is the same with the American apple. It is first, and there is practically no second.

Well then, let us see how we compare in our position with other sections of this country. I think that there is no section of the country that can lead us. There may be others perhaps as good, but I think there are none better. I do not believe we would find a Wolf River apple in the State of Washington any better than we have it here. It may be better in some respects, but I am very sure that we have the advantage in many others. That is practically the only large fruit growing section that I haven't visited personally, not as a mere pleasure trip, but to handle the apples myself, for a profit if I could get it, and to see the conditions under which they were grown and packed by the people. And I know from personal observation that no section of the country that I have been in can go ahead of us in natural advantages.

I was very much interested in Mr. Knowlton's remarks. They were very much to the point, but still there is a point that was not touched. We have all of us heard it said, time and time again, that all the people lack is to see the opportunity and have the energy to go forward and develop this industry. But I

consider there is something else necessary, and that one great trouble why we are holding back is simply this,—the lack of capital. A man in this vicinity who engages in fruit growing starts out to do something. He is at once criticized and doubted and considered a sort of adventurer, and everybody has an opinion, and it is almost always against his success. That is the most serious handicap in this fruit industry. I can tell you today that the fruit industry of this state is capable of being its leading industry. In every section of the world, the finances and the prosperity of that section must ultimately be gauged by the prosperity of its agricultural interests.

We will say that in a certain section each farm is producing perhaps a carload of products to be shipped over the railroad. Well, the result of that shipment is what the largest part of this whole community has to do business on. The only way we really get money is to produce something and send it off and get some money back. Then that goes through your channels of trade, and they all get a commission out of it. When that shipment of products is cut off your trade is curtailed, and people cannot pay their bills, and half of the people do not really understand what is the matter.

You say to a man. "Why don't you put in more trees, and cultivate them, and furnish fertilizer and grow this fruit?" Well, the man does not always tell you just why he does not do it, but if he has no capital it is a pretty hard proposition. If he buys the land, or phosphate, and he has not the cash to pay down, people are very much in doubt about that venture. And the very doubt and the very attitude that is taken towards those things are a serious matter.

Just to illustrate that point: I started in the fruit business sixteen years ago. To begin with, I was simply an apple buyer. I looked over the situation as a man will when he has gone into a business. Perhaps I looked at it more seriously after I got into it than I did before. I could not see that apple buyers ever got very rich, and I made up my mind that I didn't want to tie myself entirely to the apple business as a buyer. I had bought a great many apples around the country, and paid out a lot of good money, and I made up my mind that the growing industry was much better than the buying, so I bought a farm, and if ever a man was worried about it, I can assure you I was.

My friends nearly all were doubtful of my success. But I went to setting out trees, and when people would go along the road, I would sometimes hear their remarks. They would say: "If that fellow thinks he is going to get a living by growing fruit on that place, he will just starve to death. That is what will happen to him." And again, "Don't that man know better than to set trees up on that side hill? They never will live." And the best business man in the section said that the venture would be a failure. He said: "I have owned a farm myself, and I have capital enough to run it, and I have run it for eight years, and that farm and stock are now for sale."

But I was in a different business from that in which he was engaged, and I knew several points about the business. I didn't know as much about growing fruit then as I do now, but from the dealer's standpoint I knew it, and the idea came to me about the Ben Davis. When I was buying apples I drove into Mr. True's door-yard one day, and he was packing a very nice looking barrel of apples. I saw that they were Ben Davis apples, and I asked him how they happened to grow so large and fine. "Well," he said, "that tree grew where I cultivated." I mistook the apple at first for a King of Thompkins. It was larger than any Ben Davis I had ever seen. And it struck me that if one tree could be made to produce Ben Davis apples like that, there was no reason why a thousand could not, and I have followed, as best I could, that suggestion in regard to the Ben Davis, and in regard to others. I do not confine myself strictly to Ben Davis. In fact, today I have a great many more trees of other varieties than I have of Ben Davis. But the idea of cultivation has proven very good. I have since then added two more farms to the original purchase, and have now about five hundred acres, and as many trees as I can take care of, and perhaps more.

But we come here and talk about these things, and then we go home and do something else. We say: "It is a safe investment. It is all right." But we are not willing to invest our money that way, or to loan it to others for a like investment. A man with whom I am well acquainted has a farm with a thousand young trees on it. It is a hundred acre farm, with a good wood lot, close by a village. And among the other nice things that he had on that piece of property was a mortgage of

\$1200 that was due. Well, that man simply couldn't raise money to pay that mortgage and if another man and myself had not chipped in and used some money we wanted badly ourselves and put in four hundred dollars on a second mortgage, he would have lost that farm for the mortgage of \$1200.

Now that is the difference between theory and practice. We say these things are good, but we don't take hold of them. There are a great many men today out on the farms, with an orchard in a run-down condition, who, if they had the capital, or if they could get it, would put this orchard in first class condition, and it would pay them more than twenty per cent on the extra investment that they would be obliged to make. And right there is one of the serious handicaps of the fruit industry in this State. There is lots of capital in Maine; there is enough to carry on our business, but it is invested in something out of sight. If that same capital were invested right here at home in these things that we know are safe, it would pay twice the dividends it does where it is now. But a great many people have settled in their minds that these things are not safe and will not pay much.

Now in regard to taking care of the orchard. I am going to say that I have been looking seriously for sixteen years for a substitute for cultivation. I do not like to cultivate all this orchard ground, but I have utterly failed to find what I consider a suitable substitute for cultivation. I will tell you of a little work which I did myself. Seven years ago two sections of my orchard needed cultivation. I didn't feel as if I could cultivate it all, so I took one section and I plowed that and let the other stay in grass. The next year, after the first plowing, I took one hundred and twenty-five barrels off from that section of orchard, while I had sixty from the sod orchard. The next year I took one hundred and fifty barrels from the cultivated orchard, and sixty from the sod orchard. But the next year I seeded down the first cultivated orchard and plowed the sod orchard. The year after that I took about one hundred and twenty-five barrels from the orchard I had seeded down and I think about fifty from the one I had recently plowed. The next year, which was this year, I took about one hundred barrels from the orchard that I seeded down, and over two hundred from the orchard I had plowed recently; and the Ben



Davis which I have exhibited here were apples that came from the last plowed section. And the orchard which I kept in grass has been well fertilized. I have fertilized it with hard wood ashes, with stable dressing, commercial fertilizer, ground bone and potash fertilizer, but it is impossible to keep up that high quality of fruit.

Now the mere statement of the number of barrels from each orchard does not tell all the story. The rest of it is this: When the first plowed section bore the one hundred and fifty barrels of apples, just before we picked the fruit there was a severe gale. On that section of orchard I picked up about forty barrels of dropped fruit that I put by itself in the cellar. It happened that I shipped this dropped fruit from that orchard in the same shipment, the same day and in the same sale with a full carload of as good Ben Davis as you can buy through the country—a fair quality of Ben Davis, No. 1 and No. 2. They sold the same day, and the dropped apples from this cultivated orchard sold for eighty-seven cents a barrel more than the number ones and twos from the other lot. The cultivated orchard produces fruit that will sell for a full dollar more per barrel than the Ben Davis that are grown on my sod land, and they will keep better. There is only about half the shrinkage. Then, if you compare the expense of producing this high grade of fruit with the expense of producing a low grade of fruit, I can assure you that the high grade of fruit can be produced, at a moderate estimate, at fifty cents a barrel less than the other, as you produce so much more upon the same ground. It has cost you the same to set out one tree that it has the other. You have that whole investment to be borne by your crop of fifteen to sixty barrels a year, while you have the same investment to be borne by the crop of a hundred and fifty barrels a year. That may seem a little doubtful, but it is an absolute fact that you can produce this high grade of fruit cheaper than you can the lower grade.

I am going to say just one word in regard to the Ben Davis. I am perfectly willing that everyone should remain silent in regard to the Ben Davis. I am not anxious that other people should set out Ben Davis orchards, because it could easily be overdone. But today in the United States there are more Ben Davis raised, in my opinion, although I have not the figures,

than there are Baldwins. From the point in Illinois where the apples begin to grow, clear down through Illinois, Missouri, Arkansas, Nebraska and Kansas, the leading variety is that much despised Ben Davis. It is only despised here in New England, and by those who do not know it. I have been there and talked with the fruit growers myself, and while the Jonathan is raised down there in its highest state of perfection, I heard only one man say that any variety paid better than the Ben Davis. One man who had eighteen thousand trees, said: "I get my Jonathans off early before I get at the others, and I think they pay me about the best of any." Most of them say that their best money-maker is the Ben Davis.

But here in New England, I am sorry to say some are prejudiced against the Ben Davis. I do not believe there is a man in the State of Maine today who has put out an orchard of Ben Davis and half taken care of it, but has found it a very profitable variety to raise.

We are here for the purpose of promoting the fruit industry. That is our object. That is what we went to Boston for, and that is the purpose for which I attended the meeting of the Pomological Society a year ago. It was to see if we couldn't get together and do something for our mutual benefit. Well, we grow Ben Davis. Why not let them grow? They have been put in the market for more than thirty-five years, and they haven't yet found any market that does not want them. The Ben Davis has always sold among the best varieties across the water. But since so much has been published in the papers and said in relation to its quality, lots have turned against the Ben Davis. I think it is a very poor policy for us to run down a product that we have ourselves, that is one of our best paying varieties. There might be more Ben Davis set and taken care of if we told people to set just what they saw fit and did not try to educate them not to use the Ben Davis. The two last shipments of Ben Davis I have sent across the water, of my own growing, netted \$3.97.

The fruit in those countries is not as soft and juicy and nice flavored as ours, and they do not appreciate that in an apple. Also, the common people there use most of their fruit cooked, and they do not appreciate the difference in flavor as a great many Americans do. So I say let us produce and ship to them

what they want. I do not care to study so much what a man ought to eat and what he ought to buy in that line as what he wants and is willing to pay for. I want to supply that which he wants and is willing to pay for rather than spend my life trying to educate him to eat something that he does not want, unless what I want to sell is harmful, which we cannot say of the Ben Davis apple.





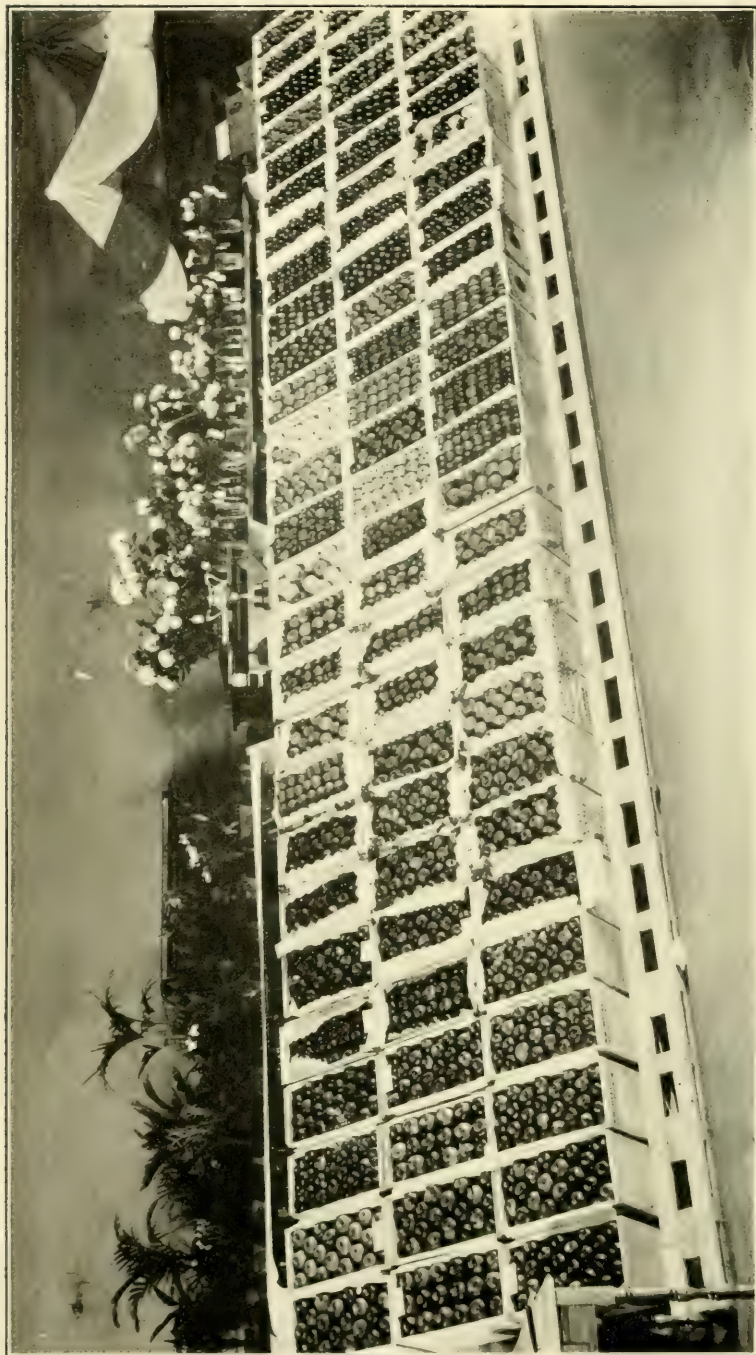
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Portion of Box Exhibit at Annual Meeting, Maine State Pomological Society, Auburn, November 8-10, 1910.



TRANSACTIONS

OF THE

# Maine State Pomological Society

FOR THE YEAR 1910



Annual Exhibition held in Auburn  
November 8, 9 and 10, 1910

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AUGUSTA

KENNEBEC JOURNAL PRINT.

1911

## OFFICERS FOR 1910.

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### *President,*

DR. G. M. TWITCHELL, Auburn.

### *Vice Presidents,*

H. L. KEYSER, Greene.

G. L. PALMER, So. Livermore.

### *Secretary,*

E. L. WHITE, Bowdoinham.

### *Treasurer,*

E. L. LINCOLN, Wayne.

### *Executive Committee,*

WILL E. LELAND, Sangerville.

F. H. MORSE, Waterford.

E. F. HITCHINGS, Waterville.

### *Member of Experiment Station Council,*

C. S. POPE, Manchester.

### *Trustees,*

Androscoggin County—Silas A. Shaw, Auburn.

Aroostook County—Edward Tarr, Mapleton.

Cumberland County—John W. True, New Gloucester.

Franklin County—E. E. Hardy, Farmington, R. F. D.

Hancock County—William H. Miller, Bar Harbor.

Kennebec County—E. A. Lapham, Pittston.

Knox County—Alonzo Butler, Union.

Lincoln County—H. J. A. Simmons, Waldoboro.

Oxford County—W. H. Allen, Buckfield.

Penobscot County—A. A. Eastman, Dexter.

Piscataquis County—C. C. Dunham, Foxcroft.

Sagadahoc County—J. H. King, Bowdoinham.

Somerset County—Frank E. Nowell, Fairfield.

Waldo County—

Washington County—D. W. Campbell, Cherryfield.

York County—J. Merrill Lord, Kezar Falls.

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## MEMBERS OF THE SOCIETY.

### LIFE MEMBERS.

Allen, Wm. H. ....	Buckfield	Knowlton, D. H. ....	Farmington
Andrews, A. Emery. ....	Gardiner	Lapham, E. A. ....	Pittston
Andrews, Charles E. ....	Auburn	Leland, Will E. ....	East Sangerville
Atherton, Wm. P. ....	Hallowell	Lincoln, E. L. ....	Wayne
Atkins, Charles G. ....	Bucksport	Litchfield, J. H. ....	Auburn
Averill, David C. ....	Temple	Litchfield, Mrs. L. K. ....	Lewiston
Bailey, W. G. ....	Freeport	Lombard, Thurston M. ....	Auburn
Bennoch, John E. ....	Orono	Lord, J. Merrill. ....	Kezar Falls
Bickford, Lewis I. ....	Dixmont Center	Luce, Willis A. ....	Columbia Falls
Bisbee, George E. ....	Auburn	Macaulay, T. B. ....	Montreal, Can
Bisbee, Stanley. ....	Mechanic Falls	Mayo, E. P. ....	Waterville
Blanchard, Mrs. E. M. ....	Lewiston	McAllister, Zaccheus. ....	West Lovell
Blossom, O. E. ....	Turner Center	McCabe, George L. ....	North Bangor
Boardman, Samuel L. ....	Bangor	McLaughlin, Henry ....	Bangor
Briggs, John. ....	Turner	McManus, John. ....	Brunswick
Burr, John. ....	Freeport	Merrill, Oliver F. ....	Gardiner
Rutler, Alonzo. ....	Union	Mitchell, Frederick H. ....	Turner
Chadbourne, C. L. ....	North Bridgton	Mitchell & Co. ....	Waterville
Chandler, Mrs. Lucy A. ....	Freeport	Moody, Charles H. ....	Turner
Chase, Henry M., 103 Federal Street,	Portland	Moore, William G. ....	Monmouth
Chase, Homer N. ....	Auburn	Moor, F. A. ....	Waterville
Conant, W. H. ....	Buckfield	Morse, F. H. ....	Waterford
Corbett, Herman. ....	Farmington	Morse, W. J. ....	Orono
Craig, William. ....	Abbotsford, Quebec	Moulton, Dr. John F. ....	Limington
Crowell, Mrs. Ella H. ....	Skowhegan	Newell, G. E. ....	Turner
Crowell, John H. ....	Farmington	Page, F. W. ....	Augusta
Cushman, Chas. L. ....	Auburn	Palmer, George L. ....	South Livermore
Dana, Woodbury S. ....	Portland	Parsons, Howard G. ....	Turner Center
Dawes, S. H. ....	Harrison	Patten, Mrs. E. C. ....	Topsham
DeCoster, Virgil P. ....	Buckfield	Prince, Edward M. ....	West Farmington
Denison, Mrs. Cora M. ....	Harrison	Pope, Charles S. ....	Manchester
DeRocher, Peter. ....	Bradentown, Fla.	Pulsifer, D. W. ....	Poland
Dirwanger, Joseph A. ....	Portland	Purinton, E. F. ....	Farmington
Dunham, W. W. ....	North Paris	Richards, John T. ....	Gardiner
Dyer, Milton. ....	Cape Elizabeth	Ricker, A. S. ....	Turner
Emerson, Charles L. ....	South Turner	Ricker, Fred P. ....	Turner
Farnsworth, B. B. ....	Portland	Roak, George M. ....	Auburn
Felch, Chas. E. ....	Limerick	Sanborn, Miss G. P. ....	Augusta
Frost, Oscar F. ....	Monmouth	Sawyer, Andrew S. ....	Cape Elizabeth
Gardiner, Robert H. ....	Gardiner	Saunders, Ernest. ....	Lewiston
George, C. H. ....	Hebron	Seavey, Mrs. G. M. ....	Auburn
Gilbert, Z. A. ....	North Greene	Simmons, H. J. A. ....	Waldoboro
Goddard, Lewis C. ....	Woodfords	Skilling, C. W. ....	North Auburn
Grover, Franklin D. ....	Bean	Smith, Frederick O. ....	New Vineyard
Gulley, Alfred G. ....	Storrs, Conn.	Smith, Henry S. ....	Monmouth
Hackett, E. C. ....	West Gloucester	Snow, Mary S. ....	Bangor
Hall, Mrs. H. A. ....	Brewer	Stanley, H. O. ....	Winthrop
Hanscom, John. ....	Saco	Staples, Geo. W., 904 Main St.	Hartford, Conn.
Hardy, E. E. ....	Farmington	Starrett, L. F. ....	Warren
Harris, William M. ....	Auburn	Stetson, Henry. ....	Auburn
Heald, U. H. ....	Paris	Stilphen, Asbury C. ....	Gardiner
Herrick, A. A. ....	Norway	Supt. Maine Sanatorium Farm. ....	Hebron
Hixon, A. A. ....	Worcester, Mass	Taylor, Miss L. L. (Lakeside) ....	Belgrade
Hoyt, Mrs. Francis. ....	Winthrop	Thomas, William W. ....	Portland
Jackson, F. A. ....	Winthrop	Thomas, D. S. ....	North Auburn
Keene, Charles S. ....	Turner	Thurston, Edwin. ....	West Farmington



## LIFE MEMBERS—Concluded.

Tilton, William S.....	Boston, Mass.	Walker, Elmer V.....	Oxford
Townsend, Mrs. B. T.....	Freeport	Waterman, Willard H....	East Auburn
True, Davis P.....	Leeds Center	Waugh, F. A.....	Amherst, Mass.
True, John W.....	New Gloucester	Weston, Joseph.....	Gardiner
Turner, E. P.....	New Vineyard	Wheeler, Charles E.....	Chester ville
Twitchell, Geo. M.....	Auburn	White, Mrs. Annie.....	Bowdoinham
Vickery, James.....	Portland	White, Edward L.....	Bowdoinham
Vickery, John.....	Auburn	Woods, Chas. D.....	Orono
Wade, Patrick.....	Portland	Wright, Frederick.....	Bath
Walker, Charles S.....	Peru	Yeaton, Samuel F....	West Farmington

## ANNUAL MEMBERS FOR 1910.

Bailey, R. G.....	Wiscasset	Lincoln, Mrs. E. L.....	Wayae
Bass, Lizzie E.....	Wilton	Littlefield, Harry W.....	Brooks
Bass, Mary A.....	Wilton	Macomber, John H.....	Jay
Beace, Harry W.....	Hebron	Marston, David.....	Monmouth
Black, H. C.....	Augusta	Maxwell, J. W.....	Sabattus
Bonns, Prof. W. W.....	Monmouth	Merrill, A. L.....	Auburn
Clement & Taylor.....	Winthrop	Merrill, C. A.....	Auburn
Cummings, R. L.....	West Paris	Merrill, H. H.....	Hebron
Day, H. L.....	Auburn	Millett, C. R.....	West Minot
Dolloff, D. W.....	Standish	Mudgett, D. G.....	Albion
Drinkwater, E. A.....	Sabattus	Newbury, F. Prescott.....	Carmel
Dunn, F. G.....	Norway	Nichols, Dr. Estes.....	Hebron
Edwards, M. O.....	Lewiston	Nowell, F. E.....	Fairfield
Frost, H. L.....	Arlington, Mass.	Paine, C. D.....	Dover
Gardner, Prof. V. R.....	Orono	Paine, Horace.....	Jay
Gee, Albert H., 261 Webster St., Lewiston		Palmer, W. R.....	Orono
Gould, Rev. William H.....	Portland	Pollard, D. A. 461 Court St., Auburn	
Gray, Ralph.....	Dover	Pulsifer, H. B. 122 Seventh St., Auburn	
Hammond, Herbert P.....	Paris	Ricker, F. A.....	Turner
Harlow, E. L.....	Turner	Kicker, W. J.....	Turner
Harlow, Harry G.....	Buckfield	Sawyer, J. W.....	Reading, Mass.
Hitchings, E. F.....	Waterville	Shaw, Silas A.....	Auburn
Hobart, H. O.....	Auburn	Shorey, L. T.....	Monmouth
Ingraham, William M., 396 Congress St., Portland		Smith, Geo. S.....	Monmouth
Irish, H. D.....	Buckfield	Smith, Dr. Owen., 692 Congress St., Portland	
Keyser, H. L.....	Greene	Smith, Woodbury A.....	So. Newcastle
King, John H.....	Bowdoinham	Sweetsir, Fred R.....	Cumberland Ctr.
King, Mrs. John H.....	Bowdoinham	Terr, Edward.....	Mapleton
Knowlton, Geo. H.....	Vassalboro	Thayer, Jarvis M.....	Paris
Lang, Ivan E.....	Bowdoinham	Tucker, Benj.....	Norway
Leavitt, Leonard C.....	Kezar Falls	Tucker, Herbert M.....	Canton
Lee, Fred W.....	Augusta	Washburn, C. C.....	Mechanic Falls
Lee, Lyman K.....	Foxcroft	Wood, H. O.....	Lewiston
Leland, Walter E.....	Mechanic Falls	Wood, Mabel V.....	Lewiston
Libby, E. H.....	Auburn	Wyman, F. L.....	West Paris
		Yeaton, Geo. A.....	Augusta

## REPORT OF TREASURER.

E. L. Lincoln, Treasurer, in account with the Maine State  
Pomological Society for the year 1910.

### RECEIPTS.

Cash on hand from the year 1909 .....	\$ 79 86
January 1, interest on Stock First National Bank, Farmington, ....	12 00
January 1, interest on Bonds First Mortgage .....	22 50
July 1, interest on Stock First National Bank .....	12 00
July 1, interest on Bonds First Mortgage .....	22 50
State Stipend .....	879 04
70 Annual Fees .....	70 00
12 Life Fees .....	120 00
<b>Total Receipts .....</b>	<b>\$1,217 90</b>

Note. In January 1911, \$74.27 was received on the 1910 Stipend which will appear in the 1911 report.

### EXPENDITURES.

January 13. Paid E. F. Hitchings, order No. 1 .....	\$ 2 06
Will E. Leland, order No. 2 .....	5 00
E. L. Lincoln, order No. 3 .....	3 70
Elm House, order No. 4 .....	3 00
January 21. Paid Permanent fund life fees, years	
1908-1909 .....	80 00
November 11. Paid Maine Farmer Pub. Co. ....	14 75
Maine Farmer Pub. Co., No. 7 ....	5 75
Maine State Bookbinding Co. ....	28 40
Lewiston Journal Co. ....	48 00
E. L. White, order 12. ....	8 00
Fred W. Adams, order 13 .....	5 16
Lewiston Journal, order 14 .....	2 00
Mrs. Mabel Boothby, order 15 ....	1 00
C. E. Hardy, order 16 .....	13 36
G. M. Twitchell .....	7 65
Loring, Short & Harmon .....	1 50
Will E. Leland .....	6 71
F. H. Morse .....	2 95
E. L. Lincoln .....	34 00
E. L. White .....	150 00
E. F. Hitchings .....	75
E. L. White .....	32 95
Wilfrid Wheeler .....	28 30
John C. Woodrow .....	4 72
Palmer Press .....	17 00
Premiums for the year 1910 .....	336 00
E. F. Hitchings .....	2 06
November 11. Paid T. M. Lombard .....	6 00
Elm House .....	68 25
George T. Powell .....	48 12
V. R. Gardner .....	7 53
W. R. Bartlett .....	1 00
Harry L. Plummer .....	1 15
Merrill & Webber .....	2 12
E. L. White .....	5 92
Miss L. B. Raynes .....	56 55

<b>Total Expenditures .....</b>	<b>\$1,041 41</b>
Cash on hand .....	176 49
	<b>\$1,217 90</b>

## PERMANENT FUND FOR THE YEAR 1910.

December 31. By members as reported for the year 1909 .....	\$,1790 00
Fees received for the year 1910 .....	120 00
Total .....	<u>\$1,910 00</u>

## PERMANENT FUND INVESTED AS FOLLOWS.

Four shares stock First National Bank, Farmington .....	\$400 00
Two bonds Stockton Springs Water Co.....	970 00
Deposit in Savings Banks .....	420 00
Due permanent Fund from year 1910 .....	120 00
Total .....	<u>\$1,910 00</u>

ELLIS L. LINCOLN, *Treas.*

## ANNUAL MEETING, AUBURN,

November 8-10, 1910.

TUESDAY EVENING, NOVEMBER 8.

The meeting was called to order by the president, Dr. G. M. Twitchell.

Invocation by Rev. F. M. Preble, Auburn.

Music.

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### ADDRESS OF WELCOME.

By HON. I. L. MERRILL, Mayor of Auburn.

*Mr. Chairman, Ladies and Gentlemen:*

It is always a privilege and a pleasure for me to extend Auburn's welcome to any visitors from whom we may expect to derive a benefit, either financially, religiously, socially or morally. It is also a pleasure to perform the same official courtesy if we may expect that the visitors are to be benefitted by their tarry with us. This is the first time, I believe, that I have had the pleasure of extending a welcome to an organization whose end and aim is the promotion of agriculture in its most fascinating branch, that of fruit growing. And inasmuch as my own private business is dependent upon the progress and development of this great industry, you can readily understand that it is a double pleasure to me tonight to welcome you here, first as an official and second as a private citizen.

It is an inspiration to look into your faces tonight, and upon the splendid display of the products of your orchards and vineyards, and to think that, although perhaps indirectly, I have had some small part in bringing into prominence this most important industry. It is eminently fitting and proper that you chose Auburn as the place in which to hold this great meeting. For various reasons is this true. First, because it is the home of your distinguished, honored and respected president. Second, be-

cause Auburn has a larger rural population than any other city in Maine, a large contiguous territory in which agriculture in its varied forms is the leading industry. Last, and not least, because Auburn is a good city in which to hold any meeting which has for its end the promotion of good.

Auburn is the largest city in Maine, and with few exceptions in all New England, when regarded from a territorial standpoint. We have a population of about 15,000 people, and an assessed valuation of over eight millions of dollars. We have located here quite a variety of industries. We have a cotton mill of no mean proportions, giving employment to some five or six hundred people annually and putting out a product which is recognized for its quality throughout the world. We have located here one of the largest institutions in the country engaged in the manufacture and the handling of dairy products, the Turner Center Dairying Association, having an output of more than a million dollars annually. We have here one of the largest meat packing establishments east of Boston. We have another large food producing institution here in the T. A. Huston Company, noted far and wide for their fine biscuits, crackers and confectionery. We have one of the largest last manufacturing establishments in the country, and in that institution may be found machinery which is the product of the inventive skill and industry of the proprietors. And we have many smaller industries.

While we are proud of these industries, the principal industry which has made Auburn famous throughout the length and breadth of the land is the manufacture of boots and shoes. Here we have nine large modern and up-to-date shoe-shops in which are manufactured shoes enough annually to give us fourth or fifth rank in all the world in this important industry. While we are proud of our industrial prominence, and perhaps satisfied with our commercialism, we are proudest of all, I believe, of the high moral plane upon which Auburn has ever stood, making it the ideal place of homes, in which to rear and educate our children. We have here eight urban churches, we have ten suburban churches, all supplied by pastors of recognized ability, and well attended by liberal and intelligent parishes. We have a high school of which we are justly proud, four grammar schools, eight primary schools, one parochial school and fifteen mixed. We have a fine library in our midst.



I not only bring you the greetings of our people, but I wish you a pleasant sojourn in our midst. I invite you to visit our public buildings, our schools, our homes, and I hope that your stay here will be so pleasant that you will come again and again to us, not only as an organization but as individuals, and you will ever find the latch-string out and a hearty and a cordial welcome. I wish you a pleasant sojourn and a safe return to your homes and firesides, and that you may carry with you pleasant remembrances of Auburn and its people.

## WORDS OF WELCOME FROM THE BOARD OF TRADE,

By the President, Mr. L. E. FLANDERS:

Sometime ago, when your genial president, Dr. Twitchell, announced that your society would meet in Auburn if suitable arrangements could be made, it gave the members of the Board of Trade great pleasure to do all we could to further these plans. We fully realize that your organization is composed of men from all parts of the State who represent the vocation in life that has been the strength and sinew of this good old Pine Tree State from the time it was organized until the present time. The farmers are the backbone of the State, and we note with interest the way they are forging ahead. The daily press and magazines are continually reporting new ideas and progress along the line of fruit growing. In the western states of course there is a greater variety of fruit grown, but we are glad to see Maine take notice and realize that with a little care and effort she may stand second to none in the product of her apples. A great many of the orchards in years past have not received much attention. They have been sort of a side line. But we are told by good authority that if as much time were devoted to that part of the farm as to the other parts Maine could easily stand first along this line.

Ladies and gentlemen, it gives me great pleasure to extend to you, as president of the Board of Trade, a most cordial welcome, and I trust that this meeting here will not only be pleasant but profitable as well, and that as you return to your different homes you will carry with you pleasant recollections of our city.

Again, in behalf of the Board of Trade I extend to you a most cordial welcome.

## RESPONSE.

By H. L. KEYSER of Greene, First Vice President of the  
Pomological Society.

If any doubt existed as to whether our executive committee had made a wise selection for our annual meeting place of this year, when they accepted the invitation of the City of Auburn, that doubt must have been at once dispelled after listening to the cordial words of welcome from your Mayor, and on behalf of the Maine State Pomological Society, I thank you, Mr. Mayor, and thank the citizens of Auburn.

To make a success of the meetings of any society, requires much detail and hard work, of which the members who do not take an active part, have very little conception. The "hundred and one" little things, take time and patience. In all of the work, we have been so ably assisted by your Board of Trade, that for whatever good fruit these meetings bring forth, a large portion of the credit they can take unto themselves with the sincere thanks of this society.

One of the speakers at our last meeting remarked: "We are entering upon a new age." We are not entering it, it is upon us and this society has a great work to perform. We want the large and small orchardists of this State to join our ranks. We want their help and experience, and want them to profit by the knowledge they gain from our meetings.

We have passed the "go-as-you-please" period of growing fruit; the procession is moving on and to merit and meet success we must keep to the front where we can hear the music.

This society has been a great education to the growers and its reward can be seen today in the gradually improving conditions of many orchards, the interest displayed and the questions asked regarding culture and spraying; but to my mind the greatest incentive to improve all of these conditions, and put the apple of the State of Maine where it belongs, second to none and the peer of many, is co-operation.

To a man who had spent all his life in mercantile business, it was amazing to learn the volume of the fruit industry of this State and the loose method of its disposal. Of three evils we can choose the least: the Boston commission man, the speculator at our door, and the foreign market with all its "ifs" of chilled, slack, wet and bad order. This is not business, it is merely producing and taking what you get. We are surely big enough and strong enough to do what the Danes have done, and they have accomplished much in the marketing of their products, by co-operation.

Permit me once more, Mr. Mayor, to thank you and the citizens of Auburn and carry the additional message to your citizens that by the active co-operation of your Board of Trade they have proven their deep interest in the welfare of your beautiful city, and shown that its business interests are in safe hands.

PRESIDENT TWITCHELL: There is no state in all the Union which has a governor more honored than is the Governor of the State of Maine; there is no state in all the Union which has a chief executive, tonight, who is more thoroughly committed to the development of his state and the building up of its resources than is Hon. B. M. Fernald, the chief executive of the State of Maine, whom I now have the pleasure of presenting to you.

## ADDRESS,

By His Excellency, Gov. B. M. FERNALD.

*Mr. Chairman, Ladies and Gentlemen:*

I have rarely been so complimented as I have been this evening in your introduction, Mr. President, and I thought as I listened to my old friend, your Mayor—for we were boys together—that I wished I was a resident of the city of Auburn.

As I look about this hall and into your countenances, and at the fruit and flowers and potted plants before me, I am prompted to say this to you,—that to achieve success is the desire and duty of every man, woman and child in the State of Maine. What is success? That man who stands at or near the head of any profession or business in which he is engaged is a successful man. And judging from this standpoint, where can you find, Mr. President, in the United States, more successful fruit growers than we have in the State of Maine. I doubt if there is another state in the whole Union that could produce fruit of such beautiful color and such excellent flavor, as you see before you this evening.

What is success? I have already said that that man who stood at or near the head of any profession or business with which he was associated was a successful man. And if there is any one business that a young man who is willing to work, who is willing to have patience, who is willing to put effort into his daily life, can go into with almost a certainty of success, it is that of farming. And where can there be anything more beautiful in life than to see the elderly gentleman, who has set out the fruit trees in his boyhood it may be, grow up and ripen into old age with the fruitage about him, with the trees that he set in youth, seeing his children coming up and enjoying the benefit of the fruits and the fruit trees he set in early life.

Now I am engaged in all kinds of farming. I am not particularly engaged in fruit growing more than in stock growing and in other lines of farming. And in the State of Maine we have, right here in this county and in the adjoining counties,



the best country on earth to farm in, and I have been in every state in the Union, Mr. President, but two. Now there are fruits grown in some sections of this country that are equally beautiful with our Maine fruit. In the State of Michigan they raise apples that to look at are as fine, and perhaps larger than ours; but they have not the flavor. They have not the keeping qualities that our fruit may have with proper care. And the one thing for the farmers of Maine is to educate themselves, and the young men particularly, that their fruit shall be properly cared for. We are living in an age when quality counts, whether it is in fruit or men. And within a few years we have learned that we can not only raise apples in the State of Maine, but grapes as fine, as sweet, as can be produced anywhere on earth. We are just beginning to learn something about these things, and I want to say that now in the State of Maine farming is not only the most profitable but it is the most popular business on earth. If a young man wants to select a business that will be profitable and popular, he wants to stay right at home on the farm, and begin where his father has left off or is still laboring. As I look into the audience this evening I see before me some of these elderly gentlemen who have made such a success. I see Mr. Tucker right before me tonight, and you will pardon me, Mr. Tucker, for mentioning your name. If you should go to his farm, to his homestead, and see the blooded stock that he has raised—he has forty head of pure-bred Holstein cattle, he has cows that he wouldn't take \$4000 for today—you would see what a profitable business he has. He is successful as a fruit grower, as a breeder of blooded stock. We are having a change, and I am glad to see that the young men are coming back to the farms. The old pioneers, those sturdy old gentlemen who during the last thirty or forty years have reared families and educated them, have remained on the farms themselves, but too many of the boys and girls have gone to the cities and to the states farther west. That is the cause of the high price of food stuffs. Now there seems to be a return to the farms and I want to say to you that the time now is when a young man can start on a farm and work up as profitable a business, and live as clean, moral and successful a life as in any other business on earth.

Now I realize that I am not the only speaker this evening. There are other speakers, but I want to say to you, my friends, that I believe in farming, that I love it as a work, that I want to see more young men remain on the farms in Maine. Take the boys who remain on the farms in our State, and compare them with those who have gone west, and you will find that those who have remained here have been more successful. The Grange has done a great work. People get together that represent different kinds of business. And it is essential, Mr. Chairman, that farmers get together and talk over the best way to do things, exchange ideas, each one giving his experience of how he has raised a beautiful apple. It is a wonderful work you are doing, and I want it to go on. I want the 59,000 farmers in the State of Maine to double in the next ten years, as they have nearly doubled in the past ten years. I want on the 59,000 well kept farms—and we have but three thousand unoccupied, untilled farms in the State of Maine, and those are rapidly being taken up—I want on every farm that can raise an apple tree to have hundreds set the next spring. We will never be able to supply the demand for fine fruit. It is bringing more money every day. Ten years ago you never saw an apple in a box as you see them here tonight. And many different ways can be provided, by discussing these matters, whereby you can place your product on the market. And always have in mind that one word and one thing,—*quality*.

Now, Mr. President, I bring you the greetings of our entire people. I am glad to be here. I am proud of the farmers of the State of Maine. A more intelligent people cannot be brought together than the men and women representing the farms of the State of Maine.

## ADDRESS.

By HON. PAYSON SMITH, State Superintendent of Schools,  
Augusta.

*Mr. President, Ladies and Gentlemen:*

If you were to go into one of the grammar schools of this city tomorrow and ask of the boys and girls there what the leading industry of the city of Auburn is, I fancy that every hand in the room would go up and every boy and every girl would be immediately prepared to answer, the making of boots and shoes. And if you were to go across the river into one of the grammar schools of the city of Lewiston and ask the same question, I suppose there would not be a moment's hesitation. The boys and girls there, having been well taught, would say that the leading industry of the city of Lewiston is the making of cotton and woolen goods. And if you were to go down to Portland and ask the same question, the boys and girls there would be prepared to answer that the leading industry of the people of Portland is that of commercial pursuits. And if you were to go to Bath and ask the same question, the boys and girls there, equally well trained, would tell you that the leading industry of the people of Bath is the building of ships. And in the larger field, if you were to ask the boys and girls of any well taught school in this State, what the leading industries of Maine are, I suppose the children would answer that the leading industries are agriculture and manufacturing.

Now, my friends, as state superintendent of public schools, I suppose I ought not to dispute all of this good teaching, yet I shall be compelled to say to you tonight, that the leading industry of none of these places is the industry that has been named. The leading industry of this city of Auburn is not the making of boots and shoes, the leading industry of the city of Lewiston is not the making of cotton and woolen goods, neither is commerce the leading industry of Portland, nor the building of ships the leading industry of Bath, nor manufactur-

ing and agriculture the leading industries of this State of Maine. The greatest industry in this State, the greatest business in which our people engage, is the great business of education.

The object of this great educational system of ours, the object of our support of this industry of education, I maintain, is the production of a high type of citizenship. That is the reason why we are supporting a system of education, in order that we may have the right kind of citizenship. And I want to state to you just briefly three of the qualities which I think we ought to aim for.

In the first place I believe that this citizenship must be an intelligent citizenship. I wonder if we realize that we are trying here in this country the greatest experiment that has ever been tried in the history of all the world. We are trying to see whether ninety millions of people, representing all races, and all conditions of society, can govern themselves. You and I both believe that this great experiment is to succeed, but I say to you, my friends, tonight, that if this great experiment is to succeed it will succeed on one, and on only one condition, and that is that we shall have an intelligent citizenship. We sometimes hear it said that it is very important in a democratic form of government that we should have wise leadership. So I say very likely it is important that we should have wise leadership, but vastly more important is it that we should have a common people able to do its own thinking, able to make up its own mind, able to face and solve its own problems, able to stand on its own feet.

But it is not enough that it should be correctly intelligent citizenship. It must likewise be responsible. We must cultivate in our body of citizenship a sense of personal responsibility. We must have our boys and girls trained in the school of responsibility. We must make them feel that they are themselves to be responsible for the getting of things done, and I feel that we ought to impress upon them through all the days of their school life, a sense of this responsibility. But these are not the main points that I want to make, because I think the schools are doing these things very well.



There is another quality that this citizenship must have, and it is the virtue that I propose to name last, and that is the quality of service. We must have a useful citizenship. We have happily come to that stage of our civilization when we regard that man as in disgrace who does not contribute something to the welfare of society; whether it be the millionaire at one end of the so-called social scale or the tramp at the other, we rightly regard any man as in disgrace if he is not doing something for the benefit of the world. Now, then, if this public school system of ours is to make for service, we must have in mind two things: First, the individuals who are being trained, and second, the society for which those individuals are being trained. I went into a little country high school in our State about a year ago, and as I went in I noticed nothing especially unusual about it, but after I had been in a little while I noticed up on one side of the room a table fitted out with various electrical apparatus; and I was a good deal interested to note, as I examined the room more carefully, that a system of electric bells had been installed, and I was very much interested to find out how these things came to pass in this common country high school and I asked the teacher about it. The teacher said "I must introduce you to the boy who will tell you about it," and he introduced me to one of the older boys. This boy had become so absorbed in this subject and he had acquired so much information regarding it, that he was able to organize a class in electricity in that high school, and there was a class of boys, five or six of them, who were very much interested in the subject. Now the point which I want to make to you tonight is this, that if that boy had happened to be interested especially in Latin, there are more than 220 institutions in this State supported by the people, in any one of which he could have taken a four years' course in Latin. If that boy had happened to have an interest in Greek, there are more than 100 institutions in this State supported at public expense wherein he could take a course of three years on that subject. And if he had been interested in abstract science, or in higher mathematics, or in ancient history, in any one of these subjects he could take a full course of four years in any one of more than 220 high schools. Now I am not going to say that the courses offered in these 220 high schools are not wise,



but I am going to say to you tonight, my friends, that there are hundreds and hundreds and hundreds of boys coming up in our State who are interested in material things, who are going to enter into the great productive industries, and it is the business of our school system to adapt itself to the needs of these boys and girls, so that the boy who has a trend toward electricity, or toward farming, or toward any other of those interests which engage the attention of our people will have a chance to discover that and will not by and by find himself stranded in some profession that is already overcrowded.

We realize, I think, better than we used to, that we are not going to need a large number of presidents, we are not going to need a large number of statesmen, but we are going to need millions and millions and millions of every day people to do the every day work of an every day world. And the thing which I want our school system here in Maine to do is to show these boys and girls that there is an honorable work to be done outside of the so-called learned professions. We realize that the great majority, more than ninety per cent of our people, are to be engaged in the handling of material things; they are to work in our mills and factories, on our farms, and I believe, my friends, that we ought not to have a system of education that shall all the time be saying to our boys and girls, "Get off the farm, get out of the shop, get out of the mill, get out of the factory, shun hard work." No. We want a system of education which will point out to those boys and those girls that the object of getting an education is not to avoid the necessity of work. The object of an education is to enable one to find his work and to do that work in the best possible way after it has been found. It has been very well pointed out here tonight by the Governor of our State, that this State of ours has met with great losses in men and women. I don't like to think of the responsibility that may rest upon our schools for this state of affairs. I don't like to think that may be our schools here in Maine have been saying to boys and girls, "Get an education that will fit you for a profession, get an education that will enable you to keep a starched collar position and avoid the kind of hard work that your fathers have had to do." We often have a great deal to say about the crops of our State. I have heard the saying, and so have you, that other states

may boast of their fine crops in one way and another, but Maine always has one great boast, and that boast is that her best crop is the crop of men and women. It is true that our best product is men and women, but I want to say that I wish we hadn't been raising quite so much of our best crop for the export trade. It means a great deal to the community, it means a great deal to the State of Maine, whether we have the kind of educational system that shall point in the right direction. It has meant a great deal to other countries. Why, do you realize that immigration to our country from Northern Europe has almost entirely ceased? And why is it so? Because those countries of Northern Europe have begun to train their boys and girls for home industries.

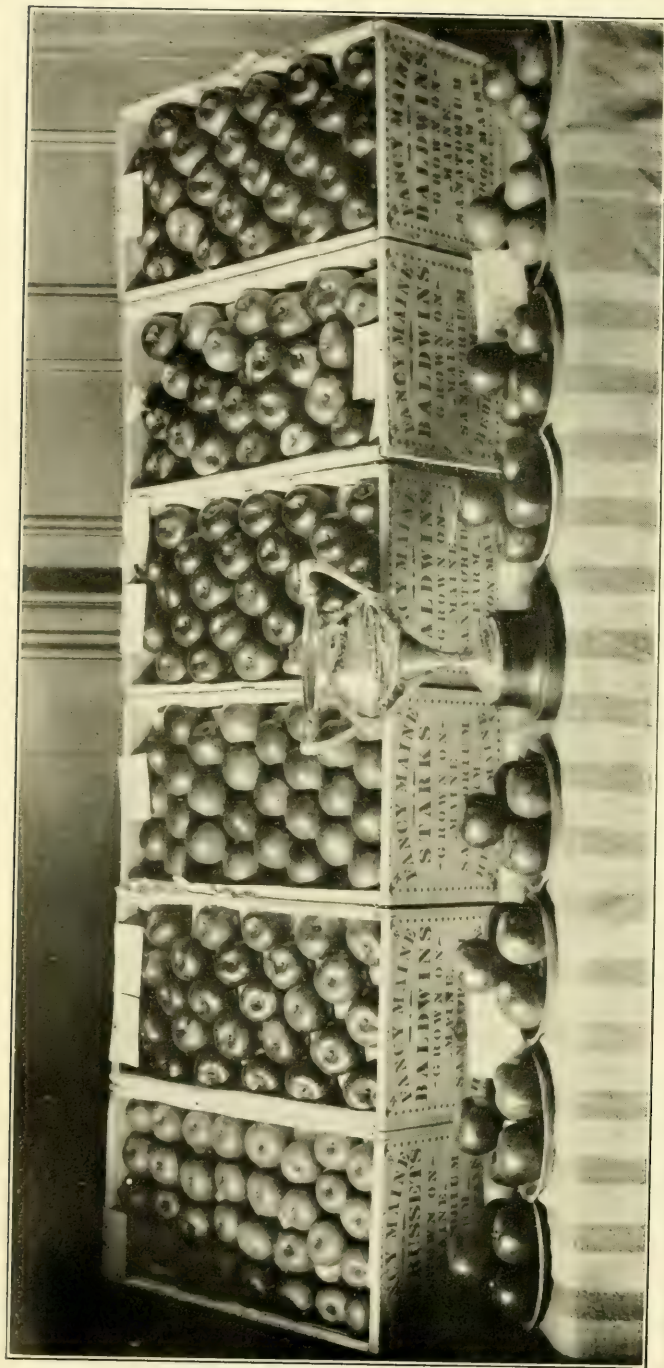
Now I realize that I have been theorizing a good deal, although I believe this theory is right and is going to come to pass in action, and I want to bring you down to a matter of hard fact for just a minute. You people who are assembled here are interested in rural education. I know that wherever there is an apple tree there are boys. I know that because there is an apple tree in my back yard, although there are not very good apples on it, there are boys around it, and I know that you people who are interested in the raising of apples are likewise interested in the raising of boys, and you are interested, a great many of you, in raising boys who are being raised on the farm, who are being educated in country schools, and I want to present to your consideration a very practical problem. I wonder if you can imagine this hall so extended that it will hold an audience on the floor of seven thousand people, and I wonder if your imagination would picture to you that hall with the teaching force of the State of Maine seated in four equal sections. Then out in this quarter section away out here we will imagine the city teachers are seated and they will not occupy a whole section even. There will be a lot of seats in the rear of the section that will be empty and those seats we will fill in with village teachers, and by village teachers I mean teachers who teach in villages having schools that may be graded so as to employ two teachers or more, up to twenty or twenty-five as some of our larger villages have to employ. Our village teachers will begin to fill in and they will take the next section and then they will take some of the third, but

nearly one-fourth of that great auditorium will be seated with teachers who are teaching in country schools. And I want to say to you, my friends, that we are not going to have the kind of educational system that we ought to have until every one of those seated in those sections shall be trained for the kind of teaching that the country school needs, and we are not going to have that kind of teaching until we people who are interested in rural education shall demand of our teachers in rural schools superior qualifications, and shall be prepared to pay for those qualifications. There are two great needs of our country schools today. I realize that the country school is the basis of the whole system, and there is little use to talk about scientific agriculture, or agricultural teachings in the schools, or any of the rest of it unless you have a good country school at the basis of the whole, and the people who live in the country in Maine ought to place emphasis on a good country school. And so I say it is the duty of the people of the State, not only those who live in the country but those who live in the cities and villages as well, to insist that these teachers who are to teach in the one-room country schools shall be well trained, shall be qualified for their places, and that they shall be paid so well that we shall be able to keep them there. I found the other day in looking over the figures that of our entire teaching force last year less than half stayed in the same schools for one year. And those are figures that I didn't like to read, and they are figures that I don't like to give you, because I am not proud of them, but they are figures that I think I ought to give you, because I believe that the boys and girls of this State are entitled to good teaching, and I feel that they are entitled to permanent teaching. And I shall not be ready to say that Maine has an altogether good system simply because it has a good school system in cities and larger towns, or larger villages, or wealthy places—I shall not be content until I shall be able to say, and the citizens shall be able likewise to echo, that every last school in Maine is placed under the instruction of a competent, well-trained, well-qualified teacher. That is the aim, I believe, which we should seek. And I trust, my friends, that we shall understand that this thing is something which must come to pass if we are to make our farms what it has been said tonight we

ought to make them, because men and women, we have learned very often, will leave the farm if it is necessary to do so in order to educate their boys and girls. Let us not make it necessary for any father or any mother to leave the farm in order to educate his son or his daughter. Let us make it possible for them to get near the farm the education that the country boy and the country girl ought to have.







Portion of Best General Collection, winning, for 1910, Maine Central Railroad Loving Cup, at annual fruit exhibit, Maine State Pomological Society, Auburn, November 8-10, 1910.  
 Exhibit made by Maine Sanatorium Farm, Hebron, Maine.

## ANNUAL ADDRESS.

By PRESIDENT G. M. TWITCHELL.

*Members of the Maine State Pomological Society, Ladies and Gentlemen:*

Another year in the history of our organization has passed and we meet to bring together the choice products of the orchards and homes and discuss the complex problems facing the grower and producer. The year has brought varied experiences to us as individuals and forced back the conviction that in seeking to push forward this industry we are constantly meeting problems we cannot yet solve, every one of which bears an important relation to our prosperity.

I wish here and now to express in behalf of this society our appreciation of the untiring efforts of Maine's Commissioner of Agriculture and his co-laborers in promoting interest in pomology in every way possible, the citizens of Auburn and Lewiston who made certain this increased exhibit of fruit through special prizes and the Maine Central Railroad who so promptly set before the apple growers of Maine a prize, the winning of which will insure life-long satisfaction to any orchardist. As officers and members we must be profoundly grateful for whatever adds to the volume of influence, looking to the increase of fruit products. Today no orchard can successfully be developed unless the grower is a student of great subjects and in fellowship with his trees.

In discussing briefly the situation, I desire to present some specific questions calling for careful consideration, that, in their solution by you, the whole fruit industry may be benefited.

Maine is a natural apple growing State and trees spring wild in every locality. This being so, the first thought with the future orchardist will be to avail himself of the strength, vitality, and enduring power of selected native stock. If this leads to the establishment of nurseries in Maine, a long step will be taken towards results now impossible. Supplied as the farms through the fruit section are so generally with bearing trees, I

am forced to the conviction that before we urge further increase we should emphasize better treatment of what we have. The man who fails to care for his old trees will never give proper attention to a new orchard. The steady increase of pests and diseases, brought here largely on fruit stock, forces attention to the trees now standing and their protection in every way possible. Beyond this there is call for an organized movement to cut down and burn every worthless tree or those so situated as to be of no earning value. These harboring spots for all pests and disease spores must be reduced to the utmost that the cost of protection for growing orchards may be minimized. It is desired that this end be reached without drastic legislation, but the protection must in some way be insured. The development of the industry outweighs the wishes of any individual and must be the sole standard of action. Today the apple industry is worth to Maine from two to three million dollars yearly. If the trees now standing, and of bearing age, were looked after and also protected from insect pests and diseases, this total would be more than doubled. Through the generosity of a life long friend of Maine, Hon. J. J. H. Gregory, and the earnest continued efforts of the Maine State Department of Agriculture, a grand total of prizes has been secured, to be distributed in 1915 and to compete nearly five hundred acres were set the past season. This means that in the not far distant future, Maine's apple crop will be greatly increased, or that, through failure to care for the trees, the industry will be lost. More than one hundred thousand apple trees were set in Maine in 1910 and well will it be if the owners thereof demand protection from neglected trees and rigid methods of treatment for growing orchards.

One of the most pernicious pests and one beyond the reach of spraying solutions, a pest which, this year, has rendered worthless thousands upon thousands of barrels of otherwise choice fruit, is the familiar railroad worm. We urge the destruction of this pest by frequent picking and burning of all dropped fruit or the feeding of the same to the hogs or sheep, but unfortunately the men who pick are at the mercy of neighbors who will not, or of native trees growing wild along the highways. The man who does not pick and destroy should be

required to do so by law that the industry may be protected and fostered. The end must be reached and you members of this society may well outline the policy of action.

The place the bee occupies in the economy of apple production is not appreciated. If we would have complete fertilization of the blossoms the friendship of the bees must be cultivated. The reason for their absence in many localities calls for investigation. Whether due in part to the continued use of arsenical preparations in spraying or not, the cause should be found and removed.

In the decrease in number of song and other birds seen about the homes, fields and orchards, there is another cause for anxiety. From a purely economic standpoint the presence of these friends of the farmer, in largest possible number, becomes a necessity.

Why have they failed to appear? What can we do to call them back? Here again we touch the problem of spraying solutions and it is one to be critically considered. The chief competitors of the New England orchardist in the next ten years will be the growers of the extreme West. After that the field of competition will broaden as the middle South and West increase their fruit crop. Certain climatic conditions and the geographical location naturally give the New England grower an advantage. He is, and always will be, from one to two thousand miles nearer the best European markets than the large growers of the West. At the same time as improved methods of caring for and shipping fruit multiply this natural advantage will become of less and less significance under methods now prevailing.

Stringent laws rigidly enforced in the extreme West, coupled with methods of care and fertilization peculiar to that section have resulted in putting upon the markets of the world fruit of remarkable size, beauty and uniformity. That it lacks in texture and flavor is as yet a minor consideration. What pleases the eye satisfies the purchaser. The lesson must be self evident. New England fruit can be grown as smooth, as sound, as uniform as that from the arid and irrigated regions and the measure of color we can insure is still an undetermined factor. Let us not forget to carry in mind the fact that we can supply in quality what can not be equalled in warmer latitudes. The



great problem facing the Maine orchardist is this: By what means can the standard of our fruit, as it goes upon the market, be raised to the level reached by certain individual growers, and uniformity in size and freedom from defects be insured? This proposition is before us and I desire to submit to you certain specific recommendations for your deliberate consideration before this session closes, in order that there may be unanimity of action in the future.

The general estimate of an apple tree is not commensurate with its earning capacity. The appreciation of the value of the fruit grown is not on the level necessary to insure rigid protection. Two dollars per barrel marks the average estimate for a series of years and this calls for only two dollar care and fertilization. There's a wide field for educational work and it should be fully occupied. Beyond there are steps to be taken which will necessitate legislative action and this society should outline the policy and secure the legislation.

1st. A stop must be put to commercial packing and by this I mean the grading according to individual conceptions of what the market will accept.

2nd. The distinction between No. 1 and No. 2 fruit must be made more pronounced. To do this the No. 2's must be eliminated by spraying and feeding as in the West.

3rd. Already I have hinted at what now becomes necessary, the amending of the law governing the grading, packing, and branding of fruit. When this law was first being discussed the Director of the Experiment Station suggested that its enforcement be placed under his direction stating that he had funds available, under the pure food act, with which to enforce the same. As the bill carried no appropriation for expenses and the State Department had no funds available for this purpose under the law it was decided to frame the law as we did. Later by decisions at Washington this expense could not be so covered. This explanation is but just in view of some criticisms made.

That the law we now have is moderate and inflicts no burdens on any honest packer is a self evident fact, yet reliable information has reached me that a combination of packers has been formed to ignore its simple requirements and also secure, if possible, its repeal. For these reasons I urge consideration



of the question of amending the present law, (a) to require that, in addition to present specifications, the name of the grower and also the packer, in plain, legible letters be placed on a card, inside of every closed package; (b) that an appropriation be secured to cover the expenses of enforcement; (c) that an amendment be secured to provide for the inspection, by proper officers, of closed packages, barrels or boxes; (d) that legislation be obtained to make obligatory the removal of all dead and worthless trees and the spraying of all orchards and living trees.

The character and uniformity of the fruit here exhibited furnish the best possible proof of what would become general all through the fruit sections of the State under the wise enforcement of such measures. The cry that these are drastic and burdensome fails utterly when we remember that the sole purpose is to lift the standard of all Maine fruit to a level where uniform quality will be guaranteed and a higher and more uniform price insured. There is no hardship, no oppression, no extra expense imposed upon any individual. Such a law would simply require of a man that he do what is for his own best and permanent good. This much the friends of the industry have a right to demand. No individual or number of individuals can in justice jeopardize the best interests of others or the permanent development of the industry. The day has gone for individual standards to govern in grading or packing fruit. The battle royal to regain and hold the markets of the East, and to the East, can never be successful until the growers of the East stand with united front to grow, to grade, and to pack the best fruit which can here be produced and to eliminate all which fails to come up to this standard. The most difficult step for the New England farmer to take is that wherein he surrenders his individuality, yet that is the universal law of business. The individual is lost in corporate interests. That this applies as tenaciously with the man on the farm as he of the mill must be recognized. Because of this individuality of work there is no means by which the interests of the industry as a whole can be safe guarded. Individual shipments of fruit remove all control and put every man's product on the market against his neighbor's. Today we are bidding against each other for business. The West has fought the fight and learned the lesson;

the South stood for individual shipments until growers became convinced that they were at the mercy of dealers at the big centres, at home and abroad.

"Truck growing which is spreading over the whole South is becoming an industry of national importance. Around Norfolk trucking is of such great extent that the value this year is estimated at \$15,000,000. Some 40,000 to 50,000 packages (crates and barrels) are daily shipped north from that port. The sweet potato producers of Eastern Virginia who formerly grew poorer on almost every crop because of the lack of organization and the glutting of some markets while others were bare, are now getting rich, raising annually hundreds of thousands of barrels, which are all marketed through a growers' association. Every carload is closely followed and ordered to market according to daily reports as to the supply and demand in different cities. The peach industry of Georgia is now being handled the same way, although the growers' association is comparatively new, while Florida orange growers last year perfected a similar plan for handling their crop. Under better handling methods the vast trucking and fruit industry of the South is daily becoming of more importance to that region as well as to the whole country which now depends so largely upon the South for early fruits and vegetables."

Organization by growers and shippers has brought relief from over competition wherever tried and will do the same in Maine. The sooner we get into line to handle our fruit in the best business-like method of today, the better will it be for each individual and these sessions should not close without initial steps being taken to protect the interests of every grower and shipper as well as final consumer. The multiplying cases of gross injustice both abroad and in markets here render absolutely necessary definite and positive action. The gross injustice inflicted upon shippers who have no representative in the great centres can be overcome only by and through such organized movement as has been indicated, where the entire shipments of a state can be handled by a single representative who can direct and divert his shipments to the best market, something impossible to individuals.

Too many orchardists are at the mercy of the market because of lack of proper storage room for fruit and this forces the

suggestion, so often presented, that this society, or its members, initiate a movement looking to the construction of storage plants at central shipping stations for the convenience of growers, the protection of fruit and the control of the industry, by those directly interested in its promotion.

The rallying cry must be Maine for Maine, and to insure this every barrel and box of fruit should bear a richly colored lithographic label, carrying the seal of the State and space for name of variety, owner and residence. These labels the full size of the barrel heads, or end of box, can be furnished at a cost of not more than one cent each. I leave these suggestions in your hands for such action as may be deemed best for all interested.

Experience is forcing the conviction that a richer nitrogenous fertilizer is demanded for the making of fresh wood. Trees lacking this growth yearly cannot resist spraying applications as can normal, healthy growing trees. The natural vigor of a tree becomes of importance when spraying solutions are to be applied and good health insures resistance not to be obtained in any other way. There is no combination of food elements better adapted to trees not making eight or more inches of fresh wood growth yearly, than what is familiarly known as Fisher's formula, one prepared by Dr. Jabez Fisher, a life-long orchardist of Fitchburg, Mass. It carries:

700 lbs. of Nitrate of Soda.

300 lbs. of Sulphate of Ammonia.

460 lbs. of Sulphate of Potash.

440 lbs. of Acid Phosphate.

100 lbs. of Kainit.

The excess of nitrogen is intended to make wood growth, to put fresh energy into the tree, and ten pounds scattered out where the branches drip is enough for a mature bearing tree.

I know of no combination of chemicals so valuable in reclaiming an old orchard or putting energy and life into neglected trees. The verdict of many confirms my own experience.

The only standard which will endure is that which makes the brand true to the contents and hold good in any and every market of the world. The next twenty years will witness a tremendous increase in commercial orchards all over the fruit sections of Maine. Our deliberations cannot be narrowed to the conditions of 1910, else we shall fail signally when the day

for larger opportunities arrives. Now is the time for us to put our houses in order and establish the fact that a barrel of apples from Maine, no matter where found or by whom packed, represents just what the label indicates. Years come and go but the measure of the man will always be determined by the character and quality of the work he does.

God has massed his blessings on these hills and up and down these valleys, and it remains for us to utilize every one for our profit and the future glory of the Pine Tree State. Uniting to insure these results, the fruits of your labors will be found in increasing quantity in all the mouths of a grateful community.

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A statistical address of value on "The United States Department of Agriculture and Agricultural Education Extension," was given by Prof. J. M. Stedman, Office of Experiment Stations, Washington, D. C.

## A TALK TO THE PUPILS OF THE AUBURN SCHOOLS.

By HON. GEO. T. POWELL, Ghent, N. Y.

It certainly gives me great pleasure to be able to drop in here this morning.

Your president has asked me to say a few words upon the subject of education which will be of particular application to the school children, the pupils of your public schools, who have come in here to attend this session of the Annual Meeting of the Pomological Society this morning. I think it speaks well for Auburn, that your educational department finds itself today in sympathy with the line of educational work which this society is doing. It speaks well for the present and the future, when the young people of this vicinity come here and attend this special session this morning, to get, if possible, some new thought, or perhaps some broader thought, in connection with their educational work.

We are confronted at the present time with some of the most momentous problems which have met our country at any time in its history. We see throughout the length and breadth of our land a phenomenal growth of cities, and at the same time there is a somewhat diminishing population in the rural districts. In some sections the rural population has fallen away very largely. Now this brings up some momentous problems. What is to be the future of the young people when they find themselves, perhaps, forced into our cities to find occupation, business, support in life? Inevitably the future means that the great majority, the masses of young people, to secure employment must go to our cities to find it. Now, in the meantime, is there opportunity yet, are there fields promising to young people in the country, on the farms, in general agriculture and particularly along the lines of fruit culture? There is no question or doubt but that one of the reasons why the cost of living is so high at the present time is because of the concentration so largely of people in the cities, with the diminution in the pro-



ductive power of the country. The producers have been growing less, the consumers have been increasing steadily, and as a natural result, when the demands on production are greater than the production itself, prices must inevitably advance. So we find at the present time the cost of living in every manufacturing town and in every city in the land has very largely increased, because there is a deficiency along certain lines of production.

Take, for instance, fruit. All this beautiful display of fruit here is prohibitive in price to large numbers of consumers.

Now, it seems to me that there is a place for those young people who have a love for country life, that here is a field that is as promising as any field of which I know at the present time for them to enter. But it is important before they enter it that there shall be some opportunity for acquiring the knowledge and the information which is necessary to enter this field of agriculture successfully. It has been a too common thought that almost anybody could be a successful farmer. If a man failed at every other undertaking in the world the general impression has been that it was only necessary for him to go upon a farm and he might succeed. The fact is very different. The man today, or the woman, who attempts to handle a given number of acres of land to be successful in the management of that land has got to be equipped with a breadth of knowledge, with a degree of intelligence, with a degree of skill, that is second to that required in no calling, no profession, no line of business in this country. When young people understand this, and understand that they must have special preparation and prepare themselves for it, they undoubtedly can enter the field of farming and fruit culture with every prospect of splendid success.

Now what is the need? As has already been indicated by Professor Stedman's paper this morning, the principles of agriculture should be taught in our public schools; in our high schools, as he has already stated, there should be technical instruction in agriculture.

At one time it was my duty to make a special investigation into the rural conditions of New York State. Along in 1896-7 I was called upon by a committee of New York people, to make a special investigation into the rural conditions. In my report to this New York Committee one of my recommendations was

that there should be some systematic plan followed by which there should be the teaching, if not of agriculture itself, of nature subjects. That is, the natural sciences should be taught in every public school, with their application made to common life.

The recommendation was at once accepted and I was authorized to put the suggestion into practical operation. I chose the county of Westchester, which is contiguous to New York City, one of the most difficult counties in the State of New York in which to test this line of work in the public schools. I thought the test there, if it should prove successful, would be the strongest and best proof we could have of the value of this kind of teaching. So I arranged with school boards and school superintendents and went all through Westchester County and had instruction given on two or three different topics. For instance, on the soil, and its relation to the prosperity of the school district; on insects; on the study of plants. I chose the best teachers that I could get from Cornell University and also from Columbia University of New York City. Assisted by those exceedingly able teachers, I went from school to school, giving only about fifteen or eighteen minute talks upon the subject, explaining to the teachers and to the boys and girls how to study these subjects relating to the life that surrounded them in the country. Now what was the result? Time after time we entered those schools the first impression that struck us was the condition of mental tiredness in that whole school. It was marked that in the midst of a session the teachers were careworn and tired, every boy and girl in the school looked tired. One of my first observations was that there is a great deal of time spent in our public schools with the present curriculum where teachers and students are mentally and physically exhausted before the end of their session each day. My suggestion was this,—not to put new burdens upon teachers, but in the midst of an afternoon session break up the course of study in such manner that fifteen minutes could be given to some nature topic—throw the entire school out of its regular channel of working. Because it is a fact that when mental weariness comes over a boy or a girl, that boy or girl is incapable of doing the best work. The suggestion was to introduce incidental

work of fifteen minutes at a time, take up a special subject, and out of it would come rest and change in the work, and at the same time very important and valuable information.

Everywhere we went this suggestion was heartily accepted by the pupils and teachers and boards of education. After fifteen or twenty minutes, sometimes more, given along these lines of nature study teaching, the children from those schools would go out from the adjournment with a bound because of the difference which had come over them during these sessions. Instead of going out physically or mentally tired, the change of work, the change of thought, sent them out from that school building in very much better condition.

The result was this: Before this work was finished in Westchester County, there came applications from thirty-five counties in the State of New York from school superintendents and boards of education, to bring the same kind of work to them.

I will give you one or two illustrations of what was the result of this teaching in Westchester County. In dealing with plants I very often chose the clover plant because I know so much the value of that and realize its importance everywhere. There were farmers who came to these schools, and said that for the first time in their lives did they understand how and why clover benefited the land. They said that if they could have had such instruction as that when they were boys, their whole history of farming would have been much different from what it had been. They hadn't realized its importance and hadn't been persistent enough in trying to cultivate it.

Another lesson which I gave was on the strawberry, and I made this offer to the children,—that to every boy and girl who would be interested to study further the strawberry plant, I would agree, if they would write me the following spring, to send a half dozen strawberry plants for them to put out, care for, and study about. Then they should bring to the public school a composition on what they had learned about that plant. I sent out over 25,000 strawberry plants to the public school children that year.

What followed the sending out of these plants? I received from the teachers of the schools some of the essays upon strawberry culture, little essays or compositions written by children not more than seven years of age, and from that up to seven-

teen. And in some of those compositions there was some of the best language used, there was some of the best instruction given—such as would grace any of the horticultural journals published at the present time—so clearly had they taken in the instruction in the schools, so closely had they followed it in the planting of these plants, so closely had they studied the habits of growth of the plant, that when they came to write about it they wrote exceedingly interestingly as well as giving very correct information as to what they had done.

I think the standard today of education in our country is exceedingly high, but I do believe that it is not being pursued in the right direction entirely, that our methods are not entirely wholesome and healthful. I believe the tendency today is too much of rushing and crowding, too much of pushing our children forward intellectually, and not enough of developing real thinking, independent power of thought, within themselves. I think that the criticism today of our public system of education is that there is too much anxiety to pass children through examinations and not enough that they shall have a thorough knowledge of what they are studying. And so I believe that it is possible for us to so modify our curriculum that in the course of study there shall be more of that kind of work which shall lead our boys and girls along independent lines of thinking. We need today as we have never needed before, correct thinking. Now what we need is a line of educational work that shall make possible a wider dissemination of population, not so great concentration in our cities, and there are hundreds and thousands and millions of acres of land that ought to be occupied with an industrious population. Our cities are growing to such an extent that when labor agitations and riotous proceedings begin because of employers and laborers being unable to agree upon certain measures in their occupation and work, we shall see in the future the most dangerous times that this country has ever seen unless we can have more of a dissemination of population and not so much of concentration as is the present tendency in our great cities. And so I believe our public schools are to solve these great problems in the future. We have got to look to the education of the boys and girls and give them



qualifications that shall enable them to go out and choose a broad line of work, such as is represented in agriculture and horticulture.

I did not expect to make a speech here this morning, but it certainly has given me great pleasure to be present at a time when the public schools of Auburn have been dismissed for one session to have their pupils come here and attend this session of the Maine Pomological Society. I trust as the result of this action there will be a new interest in the work of this society which is doing so much for the State of Maine. I trust it will result in both teachers and pupils getting some new thought that will help them in their study. And certainly I am very glad to meet you here this morning and to have the honor of speaking to you upon an important subject like this.



## CARE OF THE ORCHARD.

By EDWARD VAN ALSTYNE, Kinderhook, N. Y.

With all our great shows in New York—and we are proud of our horticultural meetings, we have two of them where the people gather by thousands, every man having paid his dollar or two dollars before he enters the door—and with all the enthusiasm, and our good program, we never have put up a show that even approximated to this. We have our exhibits that are excellent; and at our state fairs our two great societies show varieties running up into the thousands of plates, beautiful, instructive—but it is a great deal easier to get five individual specimens than it is to get a box, and to obtain a hundred boxes is harder still. And so I want to emphasize what that means and to say to you people that any state which can put out such an exhibit as that need not fear the competition of the world around.

Before I take up my special topic, the care of the orchard, I want to say a word or two in relation to the situation as a whole.

In order to care for the orchard one must first have one to care for, hence, I want to say a little about the importance and the value of orchards, and second, as to the varieties. If I could impress upon any young man, or any man just starting out in the orchard business, the possibilities in a financial way, I should feel that my visit to Maine had not been in vain.

The apple area over the United States is limited. I have little fear of competition from the Pacific slope. First, because many of the orchards in the West are short lived; next, because of transportation charges, only the very best can afford to be shipped out, and while they raise fruit beautiful in appearance it can never compare in quality with that grown in the East.

Realizing exactly what I say, I would say very emphatically that I should rather have ten acres of bearing apple orchard on land adapted to this fruit than a hundred acres devoted to the most profitable farm crop grown in Maine or New York.

Again, those who are consuming this fruit are rapidly increasing. Apples are no longer a luxury but a necessity. And let it be borne in mind that those to whom we must look to consume the major part of our crop are not the people of wealth who buy a dozen apples, or a box at a very high price, but the rank and file, who are willing to pay a fair price for a good article.

Then too, the cold storage facilities that prevent the crop being put on the market within a limited time, and also the refrigerator cars which allow it to be distributed over a large range of country, together with low ocean rates and excellent steamship facilities are giving us new and better markets every year. With these few suggestions I will now turn to the practical points of my theme.

#### VARIETIES.

As to varieties, I never specialize except when near my own home where I know exactly the condition, but I would say this: Select those varieties—of which there are many—which are known to do well in your locality; such as are strong, hardy growers, with good foliage, plenty of bearing surface, other things being equal; annual rather than biennial bearers; for the most part red fruits, of good size, and good shippers. It is well, too, to avoid those varieties with short, thick stems, that must always be bad droppers. I would have as much of quality as possible, but there must be a distinction made between varieties for a commercial orchard and those for family use. To illustrate: I grow the Jonathan and Spitzenberg. I want nothing better in my cellar, but I no longer set them in the commercial orchard. A Baldwin or Greening of the same age and with the same treatment will produce nearly three times the amount of fruit, and although the former varieties will bring a higher price, the net return to the grower will be very much less than from the last named varieties if they are adapted to his conditions.

I would avoid novelty. Many varieties are excellent in the place where they originate, but taken into a new country, particularly a southern variety brought north, it is extremely doubtful whether they will be profitable at all. Then, too, I

would select those varieties that are best adapted to the markets, most accessible to the grower, and apples that are good handlers.

With the exception of such varieties as the Tompkins County King and Twenty Ounce for example, which are not hardy on their own roots, and if grown at all must be grown on some strong stock like the Spy or the Tolman, I would set the varieties that are wanted rather than try the plan of setting strong growers and top working. In the latter case, the trees are apt to be misshapen and come into bearing less early than where they are rooted, budded or grafted. The only advantage is, that one is able to take his buds or scions from bearing fruits of known merits.

#### LOW HEADED TREES.

When I say a low headed tree, I do not mean a dwarf, but any of the standard varieties with the first branches from two to three feet from the ground. These are very much longer lived, more vigorous, and altogether more satisfactory than any dwarf possibly can be.

The claim is made that one can set very many more dwarf trees on an acre, which, of course, is true, but he will have many more trees to care for, and really less bearing surface than on half the number of standards. A further objection, fatal in itself, is that they have a shallow root system, and as the top grows, are inclined to blow over on the strain, breaking the feeding roots, which materially injures or destroys them. If they are set so deep as to overcome this, in a very few years they cease to be dwarfs, and become standards by rooting from the stock grafted in.

The advantages of the low headed tree are these: First, the branches protect the trunk.

Next, such a tree suffers very much less from wind, and fruit which falls can be gathered, and is as valuable as any on the tree. The apples can be picked at very much less expense, and with varieties like the McIntosh, often as they ripen can be put directly into a box and so easily graded. These trees, experience shows, come into bearing at an early age, and over and above all can be thoroughly and economically sprayed.

All these reasons doubtless appeal to you as good, but I

know you will be saying: How are you going to cultivate such a tree? The point is well taken, but the objection is more seeming than real. I have done my large trees more harm than good by deep cultivation close up. As a matter of fact, before these low-headed trees come into bearing they can be worked as deep as need be with a one-horse reversible beam plow, and after the limbs get too low with the modern orchard tools one can do all the cultivation that is necessary, and do it well.

#### PRUNING.

This really is a subject that demands a lecture by itself, and I can only emphasize a few vital principles. I would lay this down as the first: Prune just as little as possible to keep the trees shapely, sufficiently opened that the sun can penetrate and spraying can be well done, and to remove all diseased or broken wood. Whether to prune when the tree is dormant, or in full leaf, is wholly dependent on conditions. If the work is done in the first case in winter, when the sap is stored in the roots in proportion to the top that the tree had the fall previous, and a portion of this top has been removed, when the sap rises in the spring, it must either force an undue growth of the wood remaining, or produce a lot of suckers, both indicative of wood growth rather than the development of fruit buds. To prune at this season, then, means to encourage growth rather than fruitfulness.

If the tree is pruned when in full leaf, after the sap has been distributed through the top, a portion of this top then being removed will leave only the right quota to each branch, and the shock to the tree—for it is a shock—will tend to produce fruitfulness.

#### CULTIVATION.

When one sets an orchard he must register a vow to care for it according to the laws of trees, and of nothing else, or in other words, one cannot expect results and make the orchard a grain field or a meadow. I do not believe it necessary to give up the land entirely to trees during the first years of the orchard's life. Hoed crops, such as corn or potatoes, may be planted between the rows, keeping a good distance away from



the trees. The ground can then be cultivated early in the season and the growing crops shade the land later on. This, I believe, is better than "fillers" for ordinary man, who is carrying on his orchard work in connection with ordinary farm operations. He had better take a little more land and set only the trees for the permanent orchard rather than to attempt to set fillers to be taken out later on. The average man will leave them just "one year more" and seriously injure the permanent trees. The orchard may be seeded down occasionally with clover, and perhaps one crop of hay removed; but no grain crop should ever be grown and the orchard never left in sod more than one year.

#### SHALLOW PLOWING IN SPRING.

I should recommend shallow plowing in early spring, followed by cultivation of the ground often and thoroughly enough to prevent the loss of moisture and the destruction of all weeds. In midsummer sow the ground with a cover crop. If the trees are bearing heavily, such crop should not be put in until quite late, say the early part of August. If there is no fruit and the trees will bear a little checking it may be sowed two or three weeks earlier. What the crop shall be depends wholly on the growth of the trees. If they are growing very rank, so that the foliage is dense and the sun cannot penetrate, fungi will flourish. I would then not sow a leguminous crop, but buckwheat, oats, rape and turnips, or rye. All but the last named will die before winter, but the latter will provide a green crop which is in itself desirable, but it must be plowed in the spring at least by the time the rye begins to head, or it will do more harm than good.

If tree growth is desired, then I should use peas, or clover. We are feeling quite confident that the winter vetch is going to be an ideal crop for this purpose, although it is a little difficult to get it established. We frequently use what might be called a combination made up of a pound of rape, a pound of cow horn turnips and two pounds of red clover per acre.



## AGAINST THE SOD ORCHARD.

I want to go on record as most emphatically denouncing the sod orchard. I have some myself in which there has been no plow for more than 30 years, pastured with small stock, and they have been exceedingly profitable, but they belong to a past generation, and without question the profitable orchards the country over, are those that are cultivated from their youth up and continue to be so until the end of the chapter.

## FERTILIZERS.

I should never put any manure or fertilizer of any kind about the roots of the young trees when planted. A mulch of coarse manure above the ground may be a very good thing. Apply just enough manure to keep the trees growing and thrifty until they come into bearing and then usually it may be applied with a liberal hand. Of course, there can be too much to induce the rank growth spoken of above, but of this there need be no danger if one will observe his trees and refrain from applying the manure when there are indications that there is too much wood growth. To put a lot of fertilizer—as is often done—right about the trunk of the tree and nowhere else, is as sensible as it would be to tie four quarts of oats about a horse's leg, and expect it to get any benefit from it. As to the matter of commercial manure, I am not so clear. I have used very much of such in my own orchard, and know of its extended use in others, and in either case there was no direct benefit to the tree, although there was an indirect one, through the growth of the cover crop. This will not apply to all conditions, and I can only advise each orchardist to experiment for himself in a limited way with various chemicals, to determine whether for him it is a profitable investment.

## WHAT ABOUT SPRAYING?

I have said nothing about spraying, because I propose to treat that by itself tomorrow but for the benefit of any one who may not hear me at that time, I would say that after all these things have been faithfully carried out, there must be thorough, timely and intelligent spraying.

Mr. Bailey of Wiscasset: Situated near the seashore we have a great deal of rock-weed and thatch. Now what kind

of a scheme is it to put on a good supply of rock-weed in the fall, let it stay through the winter, and then put on 8 or 10 inches of thatch, and a salt hay which we can get in large quantities around the shore, and let it stay till fall again?

Mr. Van Alstyne: Theoretically that is all right, if it is not carried too far. I should be afraid, in putting any large amount of vegetable matter into the soil, that you could not turn it under thoroughly enough so but there would be danger of its drying out the soil. I would rather put on smaller doses at more frequent intervals. If you have a good coating of the weed that you speak of, I should think that would be all that was necessary, if you are going to plough it under. If you are going to mulch, your method is all right. There are orchards in my State, and in Ohio, in which the mulch system has been carried through with a good deal of success. But I would not recommend it except on land that could not well be cultivated. In such a case your plan would be admirable. The more material you can put on to make a mulch the better.

Mr. Cummings of Paris: I understood you to recommend having the first branches about two feet from the ground?

Mr. Van Alstyne: Yes, sir.

Mr. Cummings: Well, with a wide-spreading tree like the Baldwin, when that tree is bearing won't you have your limbs upon the ground, so that the lower limbs will be in poor shape?

Mr. Van Alstyne: Yes, that will come about eventually, just as it will come about eventually if you head the tree as we used to so as to drive a horse under it. In the latter case the time will come when those lower limbs will come down and we will have to take them off. On the other hand, the low-headed tree seems to have a greater tendency to grow upright than the high-headed tree. But the time will doubtless come when the limbs will be on the ground. I have got some now that are pretty near the ground. Now then, those limbs will either have to be shortened up, or some of them possibly will have to be removed altogether, but even then I will have a better shaped tree than if the tree were way up.

Question. How about the deep snows? Do they affect it any?

Answer. That would probably be a more serious objection with you here than with us, and yet I have an idea

that that is more seeming than real, because with the more stocky branches that you grow by that method, I think they would perhaps resist the snow more than a wide-spreading tree. I say to you frankly that where you are troubled with these deep snows, I would head higher than I would in my State, where we have less snow.

PRESIDENT TWITCHELL: During the past few years the State has purchased a farm in the town of Monmouth. It has been my good fortune to spend six or seven months yearly within a mile of that farm and know what the workers were doing there. I believe the State has been extremely fortunate in the man it has placed there as horticulturist. He comes to us with earnest and honest desire to do the very best he can for that farm, for the proving out of the great problems which now confront us. It gives me pleasure to present to you Professor Bonns, Horticulturist at the Agricultural Experiment Station, who is now to speak to you along the line of the work which he has been carrying forward on the farm at Monmouth.

## SOME ORCHARD SPRAYING PROBLEMS AND EXPERIMENTS.

By W. W. BONNS, Horticulturist, Maine Agricultural Experiment Station.

*Mr. President, Members of the Pomological Society:*

According to the program, I am to lead a discussion under the heading "The Care of the Orchard." I shall take the liberty of qualifying that announcement by confining myself to one phase of orchard management, and discuss briefly some orchard spraying problems and experiments.

This subject was selected for several reasons: First, to emphasize the continuation and extension of intelligent, timely and thorough spraying as a vital factor in the improvement of Maine's orchard industry. Second, to put before you an account of one phase of the work being carried on at Monmouth at the experimental farm, the acquisition of which was due in no small degree to the interest and efforts of your members.

It seems appropriate to me that at meetings of this nature we should come before you with an account of what is being done in the experimental field, rather than dwell upon distinct ways and means of orchard practice already well established and understood. The work of the Maine Station, as you know, is distinct from that of the Agricultural College. The latter is the means of spreading agricultural gospel from the foundation of determined facts and principles. The function of the Station is to attempt the solution of new problems and the discovery of underlying principles, so that these when solved and discovered can be transmuted into rules for practice and spread through the College and the other agents for agricultural extension work.

The time has long passed when the necessity and value of spraying for the control of insect and fungus enemies of the orchard has to be proved. In the large regions devoted to fruit growing in the Middle, Central and Pacific Coast States spraying has long been an accepted part of the annual orchard treat-

ment by all men who look to their fruit for an important source of their revenue from the land,—and rightly so. For every year has shown them that spraying properly done means healthier trees, cleaner and better fruit, and, in consequence, better returns.

Spraying in its extension has also brought with it problems for solution. For many years bordeaux mixture has been the standard fungicide for orchard spraying, with Paris green or arsenate of lead used in combination with it as the insecticide. Paris green has in recent years been largely superseded by arsenate of lead, because the former has a great tendency to burn and injure foliage, whereas lead arsenate has been found equally effective in destroying leaf-eating insects without the injurious effects upon the leaves.

The increasing use of bordeaux mixture has, however, been accompanied by reports of injury to fruit and foliage. Such injury appears to vary in degree and in different seasons. On the peach and Japanese plum it has long been known that bordeaux cannot be used with safety when the tree is in leaf. On the apple and pear the injuries have manifested themselves in two ways—burning or spotting of the leaves and russetting or corking of the fruit. The leaves so affected show dead brown spots similar in general appearance to some fungus leaf spots, generally circular or roundish, but often irregular. Frequently the areas are large, as though a number of smaller ones had united. Occasionally the margins of the leaves show the characteristic dead blackened areas. Such foliage injury is very frequently followed later in the season by yellowing and premature leaf fall. This occurs early or late in the growing season according to the severity of the injury. Sometimes it does not occur at all. Whether such yellowing is actually the result of bordeaux spraying is a mooted point among investigators, but it is an acknowledged fact that it is a frequent accompaniment of leaf injury from this source.

On the fruit the injury is first seen as small, dark, fly-speck like spots. These are not to be confused with scab spots. The former are regular, smaller and not sunken. The final appearance of the injured fruit is well known to most of you. The skin is washed with a rusty or russet colored coat which materially detracts from its appearance. In more severe cases



the apple has been stunted in growth and has suffered malformation, while the russeted surface may be greatly roughened or even corrugated. In very severe cases the skin may crack and show V-shaped splits on the surface of the fruit.

The following points seem fairly well established:—

1st. Bordeaux injury is a definitely recognized trouble.

2nd. Improperly made bordeaux is not the sole cause of injury, and excess of lime does not seem to have an appreciable effect in preventing it.

3rd. Bordeaux appears to be aggravated in its injurious action by unfavorable weather conditions following the time of spraying. Wet weather so following is especially conducive to injury.

4th. Agencies such as frost and other factors not accounted for may produce a characteristic russetting on fruit, entirely independent of any spray.

5th. Varieties vary greatly in susceptibility to injury.

6th. The severity and general occurrence of injury in certain seasons of untoward weather conditions make it probable that weather is an important factor in causing injury. Even small differences of local atmospheric conditions may account for entire difference of results.

Let me pause here to emphasize this point—that injury from bordeaux was not, and is not, a regular or annual occurrence; that up to a very short time it was the best fungicide known for orchard spraying and that in spite of the occasional injury no orchardist could afford to take the chances of exposing his crop to the certain ravages of insect and fungus enemies by abandoning the spray pump.

We find that in 1907 Professor Cordley of the Oregon Station began his series of experiments with lime-sulphur as a summer spray for the control of apple scab. These experiments he has conducted every season since, with decided success.

Three kinds of lime-sulphur preparations were employed: The so-called self-boiled, the home-boiled and commercial or factory boiled solutions. The nature of these we will consider more fully hereafter.

In general, the results obtained by these men were highly encouraging. Self-boiled lime-sulphur appears to be an essentially safe and effective fungicide for the control of peach

brown rot and scab, two of the greatest enemies of the commercial peach grower. As a means of control for apple scab it was fairly good, but not to the same degree as either the home-made or commercial concentrated forms. In addition to the action of these sprays as fungicides was the encouraging fact that they appeared to have little or no injurious effect upon the foliage when used at proper dilutions, and no injury to the fruit appears to have been reported. Both Paris green and arsenate of lead were used, with the results in favor of arsenate of lead.

For the literature bearing on this subject and the details of the experiments just mentioned those who may be interested will find references thereto in two bulletins soon to be issued by the Maine Experiment Station, one on apple diseases and their control, the other on the results of this season's spraying with lime-sulphur sprays in the orchards at Highmoor Farm.

When the Station took charge of the farm last summer, its first attempt at orchard renovation was a thorough spraying of all the trees, which were badly infested with insects and fungi. Bordeaux mixture was used, and although the pests were brought under control considerable injury, ascribed in part to the spray, was noticed on the leaves. For a large part of such injury, however, the weakened condition of the trees may be held responsible. It is not too much to assume that a tree of weakened vitality is more susceptible to causes of injury of any sort, as it has less natural resistance to them.

As you know, nearly all our trees of any promise are Ben Davis, and this variety is notably susceptible to spray injury. It was, therefore, decided to test out through a series of seasons some of the forms of lime-sulphur solutions which had been so favorably reported on in other places.

#### THE PROBLEM.

The questions to be asked by this experiment might be stated as follows:

1. Are self-boiled, home-boiled or commercial lime-sulphur sprays now on the market in Maine equal in efficiency to bordeaux mixture for the control of apple scab?
2. May the damage from spray injury on susceptible trees like the Ben Davis be eliminated by such sprays?

3. If lime-sulphur sprays do not injure fruit or foliage and yet are not equal to bordeaux as a spray, is their use commercially profitable?

4. Can arsenate of lead be as safely and effectively used with these sprays as with bordeaux?

#### THE NATURE OF LIME-SULPHUR SOLUTIONS.

What are these lime-sulphur mixtures, and how do they differ from one another? Briefly, self-boiled lime-sulphur is a chemical and mechanical combination of calcium and sulphur obtained by adding sulphur to an equal weight of lime when that lime is slaking. The means of effecting this union is the heat of the slaking lime; no other heat is employed. The spray so made is not as strong as the boiled preparations, and has less sulphur in solution. Probably for this reason it has been found less effective for apple scab.

The boiled lime-sulphur solution is made by slaking good lime, and after slaking boiling with an amount of sulphur double in weight to that of the lime used. Actual boiling is continued from 30 to 60 minutes, according to the recommendations of various experimenters.

It is known that calcium and sulphur will combine in different proportions and form different compounds; the greater the amount of sulphur present, up to a certain point, and the longer the time of boiling, up to about an hour, the greater the amount of sulphur in solution. The home-made preparations have, of course, a considerable amount of sediment left, which is strained off before using.

The commercial solutions are usually clear, but have not been found essentially different from the properly prepared home-boiled preparations.

#### THE EXPERIMENT.

For this experiment 25 rows of Ben Davis trees, about 20 to 25 years old, were selected in our thriftiest orchard. These were divided as follows:

Rows one, two and three, contained a total of nine trees. The balance of the plats consisted of two rows of six trees each, except the plot sprayed with the home-boiled solution, which had 11 trees. The trees were fairly alike in size and condition.

Some had been more thoroughly pruned and thinned out the preceding fall than others, and in consequence could be sprayed a little more effectively, but in general the conditions were reasonably uniform.

Treatment was as follows:

Row.	Treatment Sprayed With.	Manufactured by.	Amount used in 50 gallons water.	Amount lead arsenate (insecticide) added in 50 gals. water.
1, 2, 3	Checks, not sprayed ....			
4, 5	Lime-sulphur .....	Niagara Sprayer Co. . .	1½ gallons.....	3 lbs.
6, 7	Lime-sulphur .....	Bowker Insecticide Co. .	1½ gallons.....	3 lbs.
8, 9	Lime-sulphur .....	Sterling Chemical Co. .	1½ gallons.....	3 lbs.
10, 11	Lime-sulphur .....	Grasselli Chemical Co. .	1½ gallons.....	3 lbs.
12, 13	Lime-sulphur .....	James A. Blanchard Co .	1½ gallons.....	3 lbs.
14, 15	"Sulfocide" .....	B. G. Pratt Co. ....	¾ gallon.....	3 lbs.
16, 17	Self-bolled lime-sulphur.	Home made.	10 lbs. lime, 10 lbs. sulphur.....	3 lbs.
18, 19	Boiled lime-sulphur ....	Home made.....	2½ lbs. lime, 5 lbs. sulphur.....	3 lbs.
20, 21	Bordeaux mixture.....	Home made.....	4 lbs. copper sulphate, 4 lbs. lime.	3 lbs.
22, 23	Bordeaux mixture.....	Home made.....	3 lbs. copper sulphate, 3 lbs. lime.	3 lbs.
24, 25	Checks, not sprayed ....			

The Sulfocide used on rows 14 and 15 is a proprietary article advertised as a soluble sulphur spray, not lime-sulphur. The first two applications of this were as stated above, the last one was diluted to three-sixteenths of a gallon to 50 gallons of water.

Arsenate of lead was used with all solutions at the rate of two pounds to 50 gallons in the first application, and three pounds in the succeeding ones.

The applications, as careful and thorough as it is possible to make them with a hand pump were applied:—

- 1st. When the fruit buds began to show pink at the tips,—May 13 to 16.
- 2nd. Just after the petals fell,—June 7 to 9.
- 3rd. July 15 to 18.



The weather at the time of the first application was most favorable. The days were bright, mild and calm. Between it and the second application no injury could be found on any of the plots.

The second application was interrupted and followed by weather of the kind most favorable for the production of spray injury according to previous experiences with bordeaux. Showers interrupted and followed the spraying and the temperature and humidity changes were great and rather sharp. Cold, rainy periods were followed by bright, hot, humid ones. If spray injury were to be done, these were ideal weather conditions for producing it.

Observations made two to 15 days after the second spraying showed a comparatively small amount of leaf injury on all the sprayed plots except the self-boiled lime-sulphur. On those least affected it was found only by the closest observation. On others it was more readily seen, but on all the lime-sulphur plots which were affected the injury was so slight as to be entirely negligible as far as the general health and functions of the foliage were concerned. The foliage was spotted to a vastly lesser degree than the bordeaux plots, and although the spots averaged larger in size than those from bordeaux injury, the individual leaves showed on an average fewer injured areas per leaf. The application of the third spraying had no ill effects upon any of the lime-sulphur plots.

As the season advanced it was evident that so slight had been the foliage injury from lime-sulphur, even in the most severe cases, that to the general observer it passed unnoticed, and had no noticeable effects whatsoever upon the functions of the trees in developing fruit or wood. The leaves developed well, were thrifty and green and although scab could be found it did not develop to any appreciable extent. No yellowing whatsoever was seen on these trees, and the leaves remained on them until long after the fruit was harvested.

The self-boiled lime-sulphur plot suffered no leaf injury at any time during the season. The foliage was notably thrifty and green. On the other hand, leaves as well as fruit seemed to be considerably more affected with scab, showing that the self-boiled preparation is not as effective against this fungus as the boiled sprays.



Coming now to the fruit from these lime-sulphur sprayed trees we find it notably larger, cleaner and of better color, on the average, than that from either bordeaux or check plots.

So far, therefore, as foliage injury and fungus control are concerned, the lime-sulphur sprays showed themselves for this season to be a success on Ben Davis trees.

In regard to the fruit, none of the lime-sulphur sprays, not even the self-boiled, were entirely successful in preventing russetting or even malformation. In all cases, however, the percentage of deformed fruit was very small, and be it noted, *this percentage was in all cases but one no greater in amount or less than that found on the unsprayed trees*, where deformity was doubtless produced by natural causes. Hence it is difficult to say exactly how much of this deformity was actually due to the spray, and how much to agencies that caused russetting and malformation on unsprayed trees. We shall see, however, that it was only one-third as great as on the bordeaux plots. Of one thing we may be reasonably certain, judging by past experience. When conditions are right for producing such injury to unsprayed fruit by natural agencies we cannot hope to escape it on the sprayed trees. Spraying at such times may, and probably does, aggravate the condition, but that is neither reason nor excuse for abandoning spraying operations entirely.

The bordeaux sprayed plots showed the characteristic effects on leaf and fruit. The leaves were badly spotted and the fruit russeted and severely deformed to quite an extent. The foliage very evidently suffered in thriftiness, as could be noted by the casual observer comparing bordeaux with lime-sulphur, making due allowance for difference in color of the two kinds of sprays. Moreover, there was a slight amount of yellowing and some leaf fall during the season, neither of which, as already stated, appeared on the lime-sulphur plots. No noticeable differences were seen on the 3-3-50 bordeaux trees compared with those sprayed with the 4-4-50 strength.

All in all, the lime-sulphur sprays showed to decided advantage over the bordeaux, both in their effect on foliage and fruit. We shall see that their effectiveness in scab control was even a trifle better.

We come now to consider one other sprayed plot—that treated with Sulfocide. The injury done in this division was ex-

treme. After the second spraying the leaves showed very great and widespread injury two days after the second application. The tissues were in cases thoroughly scorched or burnt. Defoliation was severe and the growing processes of the trees appreciably hindered for this season. Not only was the fruit very badly damaged after the second application, but more injury was done it after the third, which was applied at the rate of but three-sixteenths of a gallon to 50 gallons of water,—a dilution greater than the weakest strength recommended by the manufacturers. The fruit was stunted in growth, deformed, badly cracked and blackened at the calyx or “blow” end. The nature of this injury varied. In some cases the calyx end was sunken, in others a similar burning of the tissues was found on the side of the apple, sometimes accompanied by splitting of the skin. Almost 50 per cent of the fruit was so affected to some degree.

It is only fair, however, to state that it has not yet been shown that this injury is due to the Sulfocide itself. It is possible,—and we are at present somewhat inclined to this view,—that the injury may be due to a combination of Sulfocide with lead arsenate whereby arsenic is set free in a form capable of doing the damage. Very similar injuries due to Paris green used with bordeaux have been noted at the Missouri Fruit Station. This is a point to be more fully determined, and for that reason we give you our observations and not conclusions. The speaker saw the orchard of Dr. J. F. Moulton of Limington last September, and the trees, sprayed with Sulfocide and Paris green with some lime added, were in excellent condition. This much, however, may be said at present; if lime-sulphur sprays, either commercial or home made, plus arsenate of lead, will give at least as good results as Sulfocide plus Paris green, then the balance is in favor of lime-sulphur, for Paris green is too unreliable to use, considering its capacity for burning foliage.

Coming now to the check or unsprayed rows, of which there were two plots, one at each end of the experimental block, we find that scab played havoc on both fruit and foliage. In addition to this, these divisions were the only ones where insect depredations occurred to any extent at all. Codling moth was here at work, and several of the leaf-eating caterpillars, including

the voracious "yellow-neck." The fall web worm was here in full force, not confining itself to leaves, but making meals off the fruit itself.

In striking contrast to these plots was the appearance of all the sprayed trees. Not even the first sprayed row next the check plots had a sign of web worms or other leaf-eating insect. The entire effectiveness of lead arsenate with the lime-sulphur solutions was evidently well demonstrated in this year's results. What insect injured fruit was found on the sprayed plots was almost entirely the work of the curculio. Since this is not a leaf or fruit devouring insect, and arsenicals are acknowledged to be of practically no use in combating it, the performance of lead arsenate for this reason may be estimated at very close to one hundred per cent.

The following table gives a comparison of results on the basis of fruit. Under scabby fruit was classed every apple that had the faintest trace of scab, even as small as a pin head. Of all the scabbed fruit considerably less than 50 per cent would be classed as badly scabbed. This should be borne in mind in examining the table.

Row.	Number of apples.	Per cent clean.	Per cent scabby.	Per cent deformed.	Per cent wormy.
1-3 Check .....	3,102	58.3	41.6	1.9	13.7
4-5 Niagara .....	7,736	92.7	7.2	2.2	0.6
6-7 Bowker .....	5,040	93.3	6.6	3.5	1.5
8-9 Sterling .....	7,765	89.9	10.0	1.3	0.8
10-11 Grasselli.....	9,563	88.5	11.4	1.8	0.5
12-13 Blanchard .....	7,699	91.0	8.9	1.6	1.0
14-15 "Sulfocide" .....	3,660	94.4	5.5	44.3	0.1
16-17 Self-boiled.....	3,181	84.5	15.4	2.1	1.0
18-19 Home boiled .....	6,551	85.2	14.7	1.3	1.2
20-21 Bordeaux 4-4-50.....	7,185	83.2	16.7	6.7	1.5
22-23 Bordeaux 3-3-50.....	5,215	85.9	14.0	5.7	1.9
24-25 Check .....	6,092	59.2	40.7	2.4	7.3

## FINAL OBSERVATIONS.

From these results we observe:

1st. Spraying with either lime-sulphur or bordeaux vastly increased the per cent of clean fruit and was decidedly a profitable operation.

2nd. Of the five commercial lime-sulphur preparations there was little difference in effectiveness. For an absolute test of this point the use of these brands over a series of years would be necessary. All of them this season were satisfactory as fungicides.

3rd. Leaf injury from lime-sulphur with lead arsenate was so insignificant as to be entirely negligible.

4th. Russetting of fruit and malformation was not entirely avoided on lime-sulphur sprayed trees. Whether this is due to the spray, to weather conditions or to a combination of both, is a point still to be discovered.

5th. Home-boiled lime-sulphur was slightly less effective in scab control than the commercial preparations. We believe that a part of this difference may be accounted for by the fact that in rows 17 to 25 inclusive the trees were somewhat larger than in those preceding, and had been pruned less severely. In consequence, the same amount of spraying would have somewhat less chance of being as effective as on trees more open to spray, sun and air. Even so, the differences are not great. Other experimenters have found the home-boiled solution very satisfactory.

6th. The self-boiled lime-sulphur was less effective in the control of scab on fruit and foliage. This coincides with the results obtained by previous experimenters.

7th. Sulfocide combined with arsenate of lead was a most undesirable spray to apply to Ben Davis trees.

8th. Arsenate of lead was eminently effective with all lime-sulphur sprays in the control of chewing insects.

9th. A comparison of bordeaux and lime-sulphur *for this year* shows a small balance of scab control in favor of the latter and a somewhat greater balance in favor of the same in the case of spray injury.

These, be it noted, are our observations of the facts; they are not our conclusions, for the latter are not ready to be made. No man in the experimental field is warranted in staking his



reputation on the results of one year's work. This much may be said: The results obtained are encouraging, and, taken into consideration with those of former experiments at other stations, point to the future solution of our spraying difficulties along the lines being worked upon. The use of lime-sulphur to date appears to be attended by desirable results as great as, and by undesirable results somewhat less than, those following the use of bordeaux, even under conditions making for spray injury. Whether such injury will ever be totally avoided with any spray when the atmospheric conditions at the time of use are unfavorable is a question that remains at present unanswered.

There are many questions still waiting to be solved in connection with this problem. One of these is variation in susceptibility to injury of different varieties. In this phase of the work the Station is handicapped by the fact that our orchards are practically confined at present to one variety for experimental purposes. We have no means of testing the effects of lime-sulphur upon different varieties, and this should be done. We know that there is a great difference in susceptibility to bordeaux injury: we must know more about it in relation to these newer sprays. It is greatly desired that some of you men interested in advancing horticultural knowledge co-operate with us by using lime-sulphur on small blocks of one or two different varieties, spraying thoroughly and noting carefully the effect upon foliage and fruit, both as to fungus control and possible injury. We should be glad to hear from members of this society who are willing to undertake such a piece of work and to follow our directions.

There are other questions to be solved. One is the minimum strength of spray that will be effective. Another concerns the chemical nature of the lead arsenate that is best to use in conjunction with the fungicide. These are some of the points which we hope to attack in the future. For the present we would say lime sulphur is worthy of a trial, but the end of the knowledge regarding it will only come from such trials.

#### HOME MADE VS. COMMERCIAL LIME-SULPHUR.

In conclusion let me say a word relative to home made vs. commercial lime-sulphur preparations.



Concentrated stock solutions, properly made and stored, have been found entirely satisfactory. Does it pay, then, for the orchardist to make his own spray? That depends largely upon the amount of spray to be used. The commercial preparation is a convenience, requiring nothing but a knowledge of its density before diluting with water. On the other hand these proprietary sprays cost from three to four times as much as an equal volume of home made material. The home-boiled concentrated stock solution if properly made and barreled, can be cooked in winter and stored for future use. It is largely a question of the man and his willingness to save money by using his own time, labor and care. Lime-sulphur sprays must be correctly made and correctly diluted when using. This point must be emphasized.

Another advantage of concentrated lime-sulphur solutions, either commercial or home made, over other fungicides, is that the same preparations are used as insecticides on dormant trees. These lime-sulphur sprays, used in greater strengths, are effective in controlling sucking insects which cannot be fought with arsenicals. At such strengths they are used when the leaves are off the trees and no injury to the latter results.

#### DIRECTIONS FOR MAKING SPRAYS.

The materials needed for making either of the home made sprays are good stone lime, free from grit or dirt, containing the least possible amount of magnesium, and sulphur. Do not use a magnesium lime. Sulphur may be either in the form of flowers of sulphur or sulphur flour.

#### SELF-BOILED LIME-SULPHUR.

The directions for making this so-called self-boiled preparation are adapted from several publications of Mr. W. M. Scott of the Bureau of Plant Industry, United States Department of Agriculture, who first devised and used it.

Use 8 lbs. of sulphur and 8 lbs. of good stone lime to 50 gallons of water. The amount of lime and sulphur may be multiplied by any amount, provided the volume of water finally used is likewise increased. Thus, 40 lbs. of lime can be used with 40 lbs. of sulphur and diluted at the end of the process to a total of 250 gallons of water.

“Place the lime in a barrel and pour on enough water (about 3 gals. to 20 lbs.) to start it slaking and to keep the sulphur off the bottom of the barrel. Then add the sulphur which should be worked through a sieve to break up the lumps and finally enough water to slake the lime into a paste. Considerable stirring is necessary to prevent caking on the bottom. After the violent boiling which accompanies the slaking of the lime is over the mixture should be diluted ready for spraying, or at least enough cold water added to stop the cooking. Five to 15 minutes are required according to whether the lime is quick acting or sluggish. The intense heat seems to break up the particles of sulphur into about the physical condition of precipitated sulphur and the violent boiling makes a good mechanical mixture of the lime and sulphur. Only a small percentage of the sulphur—enough to improve the adhesiveness of the mixture—goes into solution, but if the hot mass is allowed to stand as a thick paste the sulphur continues to unite with the lime and at the end of 30 to 40 minutes enough of the reddish liquid is produced to burn peach foliage and even apple foliage in some cases. Hence the necessity for cooling the mixture as soon as the lime is slaked.

The mixture should be strained through a sieve of 20 meshes to the inch in order to remove the coarse particles of lime, but all the sulphur should be worked through the strainer.

The amount of water required to make the best mixture depends largely upon the lime. Some grades of lime respond quickly and take a large quantity of water, while others heat up slowly and are easily “drowned” if too much water is added at once. Hot water may be used to good advantage in preparing the mixture with sluggish lime, but with quick acting lime hot water is not necessary and is more likely to bring too much of the sulphur into solution. If desired the mixture may be kept for a week or more without deterioration but should be thoroughly stirred before using.”

In applying the self-boiled mixture the spray pump should be equipped with a good agitator as the mixture settles to the bottom of the tank. In order to be evenly applied it must be kept well agitated.

## HOME BOILED CONCENTRATED LIME-SULPHUR.

In making this solution a large kettle or iron cooker of some sort is necessary. A stock feed cooker of large capacity will answer. Cookers well adapted for this work can be obtained of the Farmers' Supply Co., Philadelphia, Pa.; Montgomery, Ward & Co., Chicago, Illinois, or the Wagner Mfg. Co., Sydney, Ohio.

We give here the formula of Prof. A. B. Cordley of Oregon as the one best to recommend in view of our present knowledge of the subject.

Sulphur .....	110 lbs.
Lime, best grade .....	55 lbs.
Water sufficient to make .....	60 gallons.

Slake the lime, mix the sulphur into a thin paste with a little water, add it to the lime, add sufficient water to make 60 gallons, bring to a boil and boil vigorously for 30 to 45 minutes. The sediment is then allowed to settle, after which the clear dark amber-colored liquid is drawn off and may be stored in casks for future use."

## DILUTING CONCENTRATED SOLUTIONS FOR USE.

With our present knowledge, the strength of lime-sulphur to use—that is, the amount of water to add to a gallon of the concentrated solution—depends upon the density or specific gravity. This may be determined by a cheap and simple instrument called the hydrometer. This consists of a hollow glass tube, its lower end terminating in a weighted bulb. Placing this in a liquid, it sinks until the liquid displaced equals its own weight. In light solutions, therefore, it will sink deeper than in heavy or dense ones. The graduations to be read are marked on the scale on the neck of the instrument, and are in degrees Beaumé or in terms of specific gravity. In some hydrometers both scales are given, but the Beaumé is the one most generally used. These instruments, costing from \$1.25 to \$1.50, may be had of Bausch & Lomb, Rochester, New York; Eimer & Amend, New York, N. Y., or any dealers in scientific apparatus. They are absolutely necessary for the proper use of lime-sulphur solutions, as not only may the product of one

manufacturer differ in different casks, but home-boiled solutions will vary considerably even when the same amounts of material and time of cooking are employed.

The following is adapted from Cordley's tables for dilution:

Hydrometer reading.	Number of gallons water for one gallon solution.	
Degrees Beaumé.	Summer Strength (Fungicide).	Winter Strength (Insecticide).
32	1-30	1-12
31	1-29	1-11
30	1-28	1-10
29	1-27	1-9½
28	1-26	1-9
27	1-25	1-8½
26	1-24	1-8
25	1-23	1-7½
24	1-22	1-7
23	1-21	1-6½
22	1-20	1-6

The advantage of the concentrated home-boiled solution is that it can be made when other work is not pressing and stored in casks or barrels for future use. When so stored the barrels should be entirely filled to exclude air. If this is not possible, or when a part has been withdrawn for use and the balance is to be held for a considerable time it should be protected from the air with a thin oil coating of paraffin oil or other heavy oil.

Arsenate of lead should not be added until the solutions are diluted and ready for use.

A word more and I am done. What is to be the attitude of you orchardists in the light of our present knowledge? Will it be one of hesitation or timidity? If you have sprayed in the past are you going to lay aside your spray pump for the present? If you have been thinking of spraying for the first time next season are you going to give up the idea and wait until experiments have shown you something still more definite? If you do, let me assure you most emphatically that you can make no greater mistake. Remember that scab, leaf spot, fruit spot, pink rot, black rot, sooty blotch and canker; codling moth,



bud moth, web worm, yellow-neck, blister mite, bark louse, aphids and dozens of other injurious insects are, like the poor, always with us. We can never escape them entirely, but we can keep them under control. Keep right on spraying this year, next year, every year.

We have still much to learn, but we know enough even now so that we can go ahead. We have today knowledge which if properly applied means success in our orchards and dollars in our pockets. Use bordeaux or lime-sulphur according to your judgment from the results so far known. The Station itself proposes to use lime-sulphur on all its orchards next season.

If you have varieties especially susceptible to scab, a good plan would be to use bordeaux for the first application, before the blossoms open, and lime-sulphur for the other two. Do not be afraid to experiment yourselves; all of us will benefit by it, and you cannot lose if you do the work with care and intelligence. Get the bulletins telling you what you have to fight and how to do it. Study them carefully. Know what you are spraying for, and then spray in time and thoroughly and you will win out in the end against both insect and fungus enemies.

## COMBATING INSECT PESTS AND DISEASES.

By E. VAN ALSTYNE.

No man can expect to raise fruit which will compete satisfactorily in the world's markets, unless it is thoroughly sprayed, and freed from the depredations of insects and the marring by disease. Some may say, Why is this necessary today more than formerly? There are several reasons. First, the standard of excellence is higher, and buyers are discriminating against fruit which because of injury from one or the other of the above causes, is not only unsightly but unprofitable. Next, because as we increase our planting both insects and disease multiply; just as we find typhoid and other fevers rampant in the crowded districts of the cities, and rarely of a serious import in the sparsely settled country. The destruction of the wild plants and trees, on which many of our native insects fed, has driven them to the cultivated plants, which



being more numerous and often apparently more to their liking, cause them to multiply exceedingly. Then, too, in most cases the parasites, which in their native state held them in check, have either not followed them into civilization, or have not found the same congenial surroundings. Again, as we are bringing into the country products from the ends of the earth, we will bring in the future, as we have in the past, unknown insects, such as the gypsy and brown-tail moths and San Jose scale, all of which must be reckoned with. While this, at first glance, may seem discouraging, yet it is after all what makes our fruit growing profitable. It puts a premium on the product of the man who will grow and market his article in spite of these difficulties. I am very sure, were it not for the San Jose scale—which, fortunately, you Maine growers have not yet had to contend with—our fruits would not be bringing the present high prices. Spraying is not a summer day pastime, or a job which one may crave. It is disagreeable and expensive at best, but must be done if success in orcharding is to be attained, and when properly done no day's work in the orchard or on the farm will yield so large a return.

Simply to spray because it is fashionable, or when one has an odd moment, will avail little. One must spray for a definite trouble, do it at the right time, and do it thoroughly, or he had better not do it at all.

I am no entomologist or plant doctor, so do not propose to go into a description of the life history of insects or diseases, other than is necessary to bring out a few vital points. One must distinguish in the first place between insects which eat with their jaws, such as the potato bug or tent caterpillar, and can be controlled by poisoning the leaf surface, and those that suck their food from the leaf tissues and to which no poison does any harm, such as the various families of plant lice. These can only be destroyed by covering them with some sticky substance to stop up their breathing pores which are in the sides of their bodies. The various soap and oil emulsions, as well as the lime and sulphur washes, are all effective, but unless they can be applied when the insect is in the egg state, not always very satisfactory, for most of these insects are winged, and unless they are hit with the material they soon return, and in a few days rear up a large family to destroy the plant or to

be destroyed by the orchardist. Fortunately, such are usually migratory in their habits, and have a large number of parasites that prey on them, and only do serious damage in occasional years. It is pretty thoroughly demonstrated, too, that the lime and sulphur washes will destroy a large portion of the eggs if the application is made early in the season. There is always a vulnerable time in the life of all these pests when they can be most easily combated, hence the importance, as I have suggested, of timely spraying. The fungus troubles are in a class by themselves, and only as the various arsenical poisons have fungicidal properties will they have any effect at all in holding these diseases in check. It must be remembered, too, that they can be prevented, seldom if ever cured. Let us take specific cases. I will say nothing about the San Jose scale, or the Blister mite, which is causing us such expense in our New York orchards, but confine myself to the codling moth and contemporary insects, with the apple scab.

The codling moth lays her egg when the weather is warm enough to start the buds, usually about the time the petals have fallen from the blossoms, when the embryo fruit stands upright with the calyx leaves open. This is a convenient depository for her egg. If at this time the poison is put on, so as to fill these little cups, even though the leaves may close, the poison is secreted where the worm hatching out will get his first meal well seasoned with arsenic and goes to that bourne from which no insect ever returns. The apple scab fungus winters over in the dead leaf, and when the weather is moist and warm, which is usually about the same time as the blossoms fall, these spores shoot out into the air and attach themselves to the foliage and twigs, and if wet weather prevails, multiply at an enormous rate, living on the tissues of the leaves and later spreading to the fruit, marring its beauty and making it illshapen. If at the same time we are applying the poison for the codling moth, as well as the tent caterpillar, and sometimes canker worm, that are active at this period, we add to it a fungicide, this one spraying done just at the right time and done thoroughly, will give, in most years, clean fruit.

Without question the best poison to use is arsenate of lead. This is superior to Paris green, first because it will not injure the foliage, second, because it is adhesive, and third, united

with lime and sulphur, it increases the effectiveness of the latter as a fungicide. This can now be bought in quantities for ten cents a pound or less, and comes under a guaranteed analysis of the per cent of arsenic oxide it contains. This runs from 14 to 20; usually about three pounds to fifty gallons of liquid is sufficient to destroy insect life. The bordeaux mixture has been for many years the great standby as a fungicide, and I bear testimony to its worth for that purpose, but as we have used more powerful spray apparatus and consequently done a more thorough job, we have found increasing difficulty with the fruit being rusted. This was not as serious, of course, as the scab, but it was a serious objection, and such varieties as the Greening, McIntosh and Ben Davis were particularly susceptible. The experience of the last two years has fully demonstrated that the commercial lime and sulphur mixtures testing about 32° Beaumé, diluted with 30 gallons of water, are as efficient as the bordeaux in controlling scab, and at that strength will not harm the foliage, and even at greater strength there is no rusting of the fruit.

To illustrate the importance of thorough spraying at the right time, I will cite the work of Dr. Felt in my orchard the season of 1909. Many will remember that Professor Melander contended that in order to destroy the codling moth, there must be a coarse spray, thrown with a sufficient force to penetrate the lower calyx cavity of the apple. He asserted that it was necessary to have 200 lbs. pressure at the pump in order to do this, and his work showed clearly that such spraying done just when blossoms had fallen gave better than 90 per cent of worm-free fruit. If it were true that this pressure was necessary, it was very important that orchardists should know it. With an unbiased mind, only desirous to determine the facts, Dr. E. P. Felt, State Entomologist of New York, undertook to prove or disprove the truth of this contention, by very careful experiments in my own orchard, as well as those of Mr. W. H. Hart at Poughkeepsie, N. Y. With the exception of some minor detail, the work was substantially the same in both orchards, and being familiar with that in my own, I will describe it. The trees were 17 years set, bearing for the most part a full crop, and the orchard had been thoroughly sprayed for a dozen years. In fact, we could find very few of the

parent moths early in the season, and the doctor was in some doubt as to the wisdom of carrying on his work in this orchard, but the year previous, in spite of spraying, we had too large a proportion of wormy fruit, and I was satisfied that there were plenty of the parent moths to give us an abundant crop in a favorable season. The orchard was divided into blocks of 42 trees. The first two were Greening, the last two Baldwin. In the center of each of these blocks six trees were selected for the test. The surrounding 36 were all treated in like manner. In the first case the pressure was from sixty to eighty pounds with a Vermorel nozzle, throwing a very fine spray. The trees were thoroughly covered, but examination showed little poison in the lower cavity. On the next six center trees the same pressure was used, but a bordeaux or coarse nozzle. Just as thorough work was done, and very much more material was used to cover the tree, and a *few* of the lower cavities were filled. In the next block, from 100 to 125 pounds pressure was used, with the same coarse nozzle. There was not very much difference in the amount of material, in fact a little less than with the smaller pressure, and a larger proportion of the lower cavities were filled. In the fourth block the pressure never went below 160 pounds, and most of the time was at 200 with the same coarse nozzle. A *large* portion of the lower cavities was filled with this heavy pressure and the coarse spray. It is interesting to note that in this last block of trees, there was one tree for which the speaker is responsible, that while in his eyes from the tower apparently it was well covered, was pronounced by the entomologist on the ground to have a less thorough coating than any of the checked trees. This was noted and the results will appear in the summary. There were also three trees in the orchard left entirely unsprayed. The spray material in every case was three pounds of arsenate of lead with 50 gallons of bordeaux mixture, 3-3-50 formula. In the fall, all the fruit was counted, including the very small amount which fell to the ground, even those stung by plant lice, with the result that on all the trees, in all the blocks, there was from 97 to 98 and a fraction per cent of worm-free fruit, and there was no perceptible difference whether the spray was coarse or fine or the pressure high or low, so long as the tree was thoroughly covered. The one tree referred to above, had the



largest per cent of wormy fruit so that it brought the average of that block down about one per cent below the rest. The three unsprayed trees in the midst of the orchard thoroughly sprayed, showed 30 per cent of wormy fruit, as against less than three on the sprayed trees. Where the coarse spray was used, particularly on the lower limbs, even the Baldwins were badly rusted from the bordeaux. The results in the Hart orchard were almost an exact parallel of these just stated. In both cases, wherever there was a worm-hole in the side, examination was made to find whether the worm came from the first brood working from the center out, or was the work of a later brood entering from the outside, and showed that only in a few cases did the insect enter after the first spraying. The summary of the above would plainly indicate that so long as the trees are thoroughly covered, at this critical time, with an adhesive poison, like arsenate of lead, one thorough spraying is sufficient to make the fruit practically worm-free; that the coarse spray is of no advantage and much more expensive because wasteful of material; that the high pressure is desirable because the work can be more rapidly done, but by no means vital for good results; that the bordeaux mixture, although controlling the scab, reduced the market value of the fruit. In my own orchard the work was all done with a hand pump but power size; in Mr. Hart's the power came from a gasolene engine.

This experiment was repeated by Dr. Felt in orchards of Mr. Hart and of a neighbor of mine the past season (my own Baldwin orchard having so small a crop that the test would have been unsatisfactory) and his results were practically the same as in 1909. The results obtained by the speaker this past season—although no accurate account was kept—were as satisfactory as those of a year ago, but instead of the bordeaux we used commercial lime and sulphur, one to 30, with the three pounds arsenate of lead, and we had neither apple scab nor rust, nor was there the slightest injury to the foliage at any time. The Ben Davis packed this year were the only ones that I ever barreled of which I was proud, for hitherto, however free they might have been from worm or scab, or however large, their beauty—for that and their productiveness is all they have to commend them—was always marred by Bordeaux rust.



Further comment from me I think is unnecessary. An application to Dr. Felt at Albany, N. Y., will doubtless bring his last year's report, with this matter carefully tabulated, and illustrated with photographs, showing the piles of apples, wormy and free; all of which should convince the most skeptical of the value of a spraying so long as it is done at the right time with the right material and thoroughly.

### SOME ESSENTIALS IN THE PLANTING AND BRINGING INTO BEARING OF SUCCESSFUL APPLE ORCHARDS, CONSERVATION OF SOIL FERTILITY, AND THE PROPAGATION OF MORE PRODUCTIVE TREES.

Address by HON. GEORGE T. POWELL, President of the Agricultural Experts' Association, New York.

With the great acreage that is devoted to apple culture, it is a surprising fact that the production of this great staple fruit, and the best of all fruits, does not keep pace with the demand for it.

So short has the supply of apples been for several years, so high has been the cost in recent years, and so much greater has been the increase in population than the increase in the supply of the fruit, that they have been beyond the reach of the great mass of consumers.

In 1900, the orchard products of the United States were worth \$83,571,840. Of this amount California produced \$14,526,786, and New York \$10,542,272. Of the total number of fruit trees planted, the apple represents 55%.

In 1896, our apple crop reached 69,879,000 barrels. In that year Maine produced 2,419,000 barrels, but in common with all other apple-producing states, the yield has been greatly lessened since.

For this condition of a great shortage of apples, year after year, there are three principal causes—depleted soil, non-productive trees, and injurious insects.

While after two centuries of production, the soil of New England is by no means exhausted of its fertility, it is to an extent depleted, and to a degree that the orchards are not maintaining their old-time yields.

Every bushel of apples, potatoes, corn, and grain produced, takes out of the soil nitrogen, phosphoric acid and potash, and unless some return of these is made, the time must come when there must inevitably be a reduction in yield.

Every ten years, 35 bearing apple trees will take out of an acre of soil, 619 pounds of nitrogen, 140 pounds of phosphoric acid and 716 pounds of potash, and if this is continued over a long period of years, without ploughing in green crops and adding some new plant food, soil and trees alike will fail to produce paying crops.

#### THE SOIL.

The apple will grow in a variety of soils. Even on a poor soil it will struggle to maintain its life and to reproduce through its fruit, as reproduction is the real object of all life, animal and vegetable. There are, however, certain kinds of soils that are much better adapted to the development of apple trees than others. A soil that contains a certain amount of clay in its composition is excellent. Trees will grow in a stiff clay, but such soil is often over-saturated with water and trees will not do their best with too much water about their roots. Air which is necessary for the roots of trees and for all plants, is frequently shut out by the water in a clay soil. Such soil should be well underdrained, before trees are planted in it.

A soil that is made up of a mixture of clay and sand, and is known as a clay loam, is excellent for apple trees.

Trees will grow in a sandy soil, but they will not grow so large, neither will they produce so much fruit. The trees and the fruit on sandy soil are more subject to insect attack, for insects thrive better in a dry soil than in one that holds water for a long time.

There are, however, variations in sandy soils, that produce not only good trees, but an abundance of excellent and beautiful fruit.

The subsoil is an important factor in the planting of trees, and its quality and character should be understood. It is closer and more firm than the top soil, and retains moisture longer, but it may be made up of such fine particles of clay, and with so little vegetable matter in it, as to be impervious to water, and this constitutes what is known as hard pan, and if this lies up to within a foot of the top soil, trees will not thrive in it, neither will they produce much or good fruit.

Such formation near the surface prevents the water in the soil below from rising to supply the needs of vegetation, through long periods of drought. Where a hard pan formation may exist from six to ten feet below the surface, it is of great value, for there a certain moisture supply is assured through dry seasons, especially where frequent cultivation is given to the surface soil.

#### SOIL FERTILITY.

One of the great problems before our country now and for all time, is the conservation of the plant food of the soil, and its economical increase.

This may be accomplished in two ways,—by tillage, and by the growing and ploughing in of leguminous crops. There is yet a great amount of plant food in the soil, but much of it is in unavailable form. More and better tillage will improve any soil. Too generally, ploughing is hastily and poorly done. The real object of ploughing is not alone to prepare the soil for a seed bed or for the better planting of trees, but to get at the plant food that is essential to the growth of vegetation.

Every atom of soil contains plant food, and the greater the division, and the finer the particles of soil are made, the more readily may the roots of trees and plants get from them the plant food they require.

After more than six thousand years of production on the soil of the older countries of Europe, crop yields are larger and steadily increasing, and this is due to the more intensive tillage that is done more than to any other one cause.

At Orchard Farm, for a period now reaching over sixteen years, I have been growing clover and ploughing it in, as a means of improving the soil, and have the evidence of a marked increase in production and general improvement. The first efforts in the use of crimson clover were most discouraging; but few plants grew after the germination of the seed, but by persistence in repeated sowing of the seed on the same ground, a steady increase in the growth of the plants was secured, until at the present it is only necessary to sow the seed, when a strong growth is obtained.

After a season of over five months of protracted drouth, with only occasional very light showers, there is on one hundred acres of orchard of 10,000 trees a luxurious growth of clover

which has added not only all of the nitrogen the trees require, but a large amount of humus which for years has been built up in the soil by the continued ploughing in of the clover crops. The orchard land is ploughed in the early spring, and harrowed weekly, until early July, when eighteen pounds of clover seed per acre are sown, one-half of which is Crimson and the other half Mammoth Red clover.

By this method, any soil, however poor, may be in time greatly improved and its productive power largely increased. To be successful in obtaining the regular growth of clover, there must be present in the soil the bacterial life that is essential to the nourishment of the clover plant, and if this is deficient, as is the fact in much of the older soil of the East, it must be supplied by artificial inoculation. The growth of clover may often be much improved and aided by a liberal application of lime, and by a few hundred pounds of potash and phosphoric acid per acre.

Where the soil is not in the best condition at the time of planting an orchard, this method of soil improvement may be adopted and the soil and trees both benefited at the same time, and while they are growing.

#### THE PROPAGATION OF THE TREES.

Next in importance in the establishment of a productive orchard is the right propagation of the trees. A mushroom may complete its growth in twenty-four hours, but an apple tree not in a century, hence in planting this most desirable of all fruit trees, it is of vital importance that the best condition be obtained in the tree. From the long life and value of an apple tree, its propagation becomes of the first importance.

In nursery practice, the seeds of the apples are sown in rows and the seedling trees either budded or the pieces of the roots grafted with the desired varieties taken from the nursery rows. I always prefer to plant trees that have been grown from whole roots rather than piece roots.

Trees propagated in the former manner have no particular character. They are uneven in quality, and have little uniformity of bearing or general character of tree and fruit. In looking over most orchards, very few trees will be seen that are alike in form, while the fruit on the same tree will vary largely;

some apples will be round, others flat, of the same variety. This makes box packing most difficult.

Too little thought and attention have been given to the propagation of trees with reference to obtaining definite quality, as constitutional vigor, character of growth, and productiveness.

Twenty-one years ago, I was asked to address a nurserymen's convention where I advocated the value of propagating nursery trees, from the selected buds of well known bearing trees of the different varieties that had a record of years of production where their quality and habits were well known, claiming that by such means, a far more valuable and productive class of trees might be obtained.

A very large majority of the nurserymen present were opposed to the proposition and said that a bud was a bud, and a scion was a scion, and it mattered little from what source it came, it would make just as good a tree. They gave no consideration whatever to the individuality of trees, or to the differences or individuality of the buds on the different parts of a single tree.

That great variations in trees exist, is plainly to be seen in any orchard. There are no two trees that are alike. They differ in growth, in form, in productiveness, and their differences may be closely seen by observing the trees in any row of the same variety in any orchard and under the same general care and management.

For many years one of the largest apple orchards in the United States, planted and growing in the rich soil of Kansas, did not yield above an average of 22 barrels of apples per acre, and after more than a quarter of a century of such low production the orchards are cleared, and the land again devoted to wheat. On the other hand, there are orchards that are producing an average of six barrels to a tree, and 170 to 180 barrels to the acre. The present season individual trees have produced from 16 to 19 barrels of apples. It is reported that in New Hampshire, F. H. Gowen of Stratham picked 17 barrels from one tree, while George Gowen of the same place picked 19 barrels from one tree.

These illustrations show the great difference that is found in the production of fruit. The general practice among nurserymen is to take their buds or scions from the young trees grown in their nurseries to work on their seedling stocks.



Trees have two functions—one of growth, the other of production. The young nursery tree has a natural tendency toward growth, and if buds are taken from these, the vegetative tendency is transmitted to the seedling stocks in the nursery, and under the general management given to trees, orchards seldom produce much fruit before from twelve to fifteen years.

There are, however, varieties that will begin to bear sooner than others, as the Duchess, and Wealthy. Where trees are budded or grafted from the buds taken from mature bearing trees that have come into bearing early and have been persistent in bearing quality, there is a stronger tendency imparted to the young trees to begin bearing at an earlier age. We have selected buds from Rhode Island Greening trees of great bearing quality and at three years from the time of budding two-year nursery trees, have picked one-half bushel of fruit from them.

During the present season, from Wealthy trees, six years planted, two years old when planted, and budded on nursery seedling stock with buds from special selected trees of great bearing quality, we have netted \$60.00 an acre for the fruit, after paying for barrels, picking, packing, freight, and commission in selling. The Newtown is a variety that is long in coming into bearing. We have an orchard budded with Newtown, on two-year-old nursery trees, from buds selected from very prolific trees, that are showing fine specimens of fruit, the third year. We judged the fruit at the American Institute from the trees from which the buds were taken, apples that took first prize for three years in succession, and the specimens thus far borne by these young trees show the same general character of good size, uniform shape and fine finish of skin.

That there is a large field for the improvement of the yield of apples from the careful selection of propagating material from strong ideal productive trees, there is no doubt.

Yields of potatoes, corn, and wheat have been largely increased through this principle of selection, and there is no reason why fruit trees may not be improved through the same method.

That certain diseases that attack some varieties of trees may be overcome by selection of both stock and scion, is quite conclusively demonstrated through more than twenty years of work along this line.

It is well known that the King tree as usually grown is subject to canker and is short-lived. Very few King orchards are planted for the reason that the tree fails early, and the blocks of this variety are badly broken, before they reach a profitable bearing age.

Twenty-one years ago, we planted a block of Northern Spy trees, for the foundation of a King orchard. We chose the Spy tree, because of its great vigor and hardiness. We then looked for the best specimens of the King trees that could be found, that had, at thirty years of age, vigor and freedom from disease, with large production of fruit of uniform good quality. The two-year-old Spy trees were grafted with the scions of these superior King trees, and up to the present time, there has been no appearance of canker, while the trees have borne regular crops of the finest fruit.

In top-working there is one important point to be considered, that of the right union between the stocks.

There is a difference in different varieties in regard to a congenial uniting of the stocks, and this is important to ascertain and to be understood. If there is not a strong and perfect union between the bud or scion and the stock, bacteria will get in their work and there will be a diseased tree in a few years.

The Tolman Sweet is also a stock upon which other varieties will unite well. More work and study are needed along this line to ascertain the kinds of stocks and varieties that will assimilate and make the best union in top-working, and in propagation in the nursery.

#### TILLAGE OF ORCHARDS.

In the East, the value of tillage to produce more and better apples is not fully understood. A great majority of orchards are in sod and the crop of apples is an irregular product. The growers of the Northwest are intensive cultivators and as the result of their better work and more attractive fruit they are steadily commanding the best trade of the world.

The secret of their success is small orchards. Many do not exceed five and ten acres, and to these frequent tillage is given, when large yields of high quality fruit are obtained.

There are many New England hillside orchards, too steep and rocky to admit of cultivation, or even spraying with machinery, and while they are more or less productive, and the

flavor of the apple is better than the western grown apple, yet the best trade will not take them. To obtain the best fruit that will command the highest value, it will be wiser to take a few acres of the best land on the farm for future planting and give to them higher culture and more spraying.

In the soil survey and investigations that have been made in New York State, it has been found that the cultivated orchards yield 80% more fruit than an equal area in sod, and that the quality of the apple is better.

Tillage not only improves the soil, but conserves the moisture, which gives larger yields and better fruit.

#### INSECT CONTROL.

When we realize that there are over 300 different species of insects that attack the apple tree, the wonder is that there should be anything left for human use. Fortunately they are not all seriously injurious.

In attempting the control of insects, it is important to understand those which it is necessary to control.

There is much spraying done that is ineffective because the right materials and methods are not used.

There are two types of insects to keep in mind, which need entirely different treatment. One is the sucking class, which suck the sustenance from the wood, foliage and fruit. This is known as the plant lice type, the aphids, that curls up the leaves of the new growth. The San Jose scale belongs to this class, and is one of the most destructive in its work, now very generally spread over most of our country. For these insects, oily sprays need to be used. They are killed by contact of the material with their bodies. We have used kerosene emulsion extensively, but find Scalecide more convenient and for the San Jose scale, more effective. Lime and sulphur mixture is also effective if it is properly made and applied.

There are now many commercial brands put out, and while we have used them, they have not proved as effective as Scalecide. In a comparative test made a year ago, few scales were killed by lime and sulphur and the spread the past season was very great, while Scalecide used on the same day, in the same orchard, gave far better results.

For the apple aphid, one gallon of Scalecide to thirty-five of water will be effectual sprayed on as soon as the insect is dis-

covered. For the scale, one gallon to fourteen of water, sprayed on the trees as soon as the foliage is off in the autumn, will kill it. Very thorough work must be done. Too much spraying is only half-way done.

The other class of insects to be understood, is the chewing and biting type. These are the apple-tree tent caterpillar, the canker worm, the gypsy and brown-tail moths, and others that eat foliage and fruit. For these a poison must be used. Arsenate of lead is one of the best materials to use, provided it is pure. It adheres better to the foliage than Paris green, and should be used at the rate of  $2\frac{1}{4}$  pounds in 50 gallons of water, or in lime and sulphur in a summer spray. This should be used as soon as the blossoms fall and again in ten or twelve days. If the spraying is very thoroughly done, these two sprayings should destroy the codling moth and give 95 to 98% of perfect apples, free from worms or blemish. A third spraying about the middle of July should give protection wherever a second brood of this moth appears.

The brown-tail moth is a serious menace to New England orchards but it may be controlled. For several years I have had the directing of the development of one of the largest orchards in New Hampshire, planted by the late Wm. H. White, at Pittsfield.

In August several thousand apple trees are regularly sprayed with arsenate of lead, 2 pounds in 50 gallons of water, just as the young caterpillars begin to eat the foliage before hibernating for the winter.

One thorough application will clean them out effectually and before any damage is done by them. In a recent examination of this large and very promising young orchard, I found but two nests that had in them live caterpillars, so thoroughly had the spraying been done.

In the future planting of orchards, low headed trees should be adopted. For this policy there are several good reasons. Spraying can be done much better on low trees, the fruit can be picked much more rapidly and at less cost, and there will be far less loss of fruit from wind storms.

From old trees, thirty-five feet high, it costs 25 cents a barrel to pick the fruit that is left after storms, while the cost is but 6 cents a barrel on trees eighteen feet high.



## THE ORCHARD PLAN.

There are many ways in which to plant trees. The general plan is to plant in squares 30x30 feet. Some are planted 25x25 and both of these distances are too close for most varieties. At Orchard Farm we plant standard permanent trees 40x40 feet, such as the Baldwin, Rhode Island Greening, Northern Spy, and McIntosh, and interplant with early-bearing kinds as Yellow Transparent, Duchess, Wealthy, and Wagener at 20 feet each way. This gives 110 trees to the acre.

It is expected to take out the interplanted or filler trees in about twelve years, as the conditions may demand and the permanent trees may require the entire space.

In planting, two-year-old trees are used, and they are headed down to within twenty-six to thirty inches of the ground, and the tops of the trees are well cut out in pruning. By pruning on the under side of the lower branches an upward tendency will be given to the growth. The base of these branches will be strong and for years cultivation can as readily be done as with trees headed up five or six feet. For this class of trees we need different tillage implements. These may run under low trees on extension beams, while the team may keep away from the trees.

We do not need to cultivate the soil deep about trees; light surface tillage is better.

## PLANTING PLAN.

o	x	o	x	o	x	o	x	o	x	o
x	x	x	x	x	x	x	x	x	x	x
o	x	o	x	o	x	o	x	o	x	o
x	x	x	x	x	x	x	x	x	x	x
o	x	o	x	o	x	o	x	o	x	o

In this plan the *o* represents the permanent tree 40x40 feet, and the *x* the interplanted or filler trees. This will give 110 trees to the acre.

While this plan of planting orchards is yet largely experimental, we are getting some satisfactory results with trees planted six years on this plan. During the present season we have harvested Wealthy apples and other varieties that after paying for picking, packing, barrels, freight and commission have given a fair net profit per acre. This for six-year-old



trees from planting, and two years old when planted, we consider pretty good results, and there are certainly six years more of crops to be had from these trees before the Northern Spies will need the space, and each year will give largely increased yields. At least one-half of the apples were thinned from the trees, and not enough fruit was then taken off.

In planting again I would change the distance and plant the permanent trees 45 feet apart. We have Duchess trees of the same age that did nearly as well as the Wealthy. This plan is to be cautiously advocated. I am advising and directing other large orchard plantings on this plan, but when the time comes that the filler trees should be taken out, they must go even though they are paying well.

The danger with this plan, is that many who would adopt it, would fail to take out the trees when necessary to do so, and thus ruin their entire enterprise. No man with a weak backbone should plant trees on this system.

#### DISEASES OF TREES.

As with insects, trees have to contend against diseases. These are mainly canker, collar rot, and twig blight. Also the fruit is more or less subject to the apple scab fungus, which disfigures it for the market.

Bordeaux mixture has been the main and most valuable material to use for these conditions, but for the last few years it has produced injurious effects upon apples by russetting the skin of the fruit to such an extent that by many it has been abandoned. Effort has been made to obtain substitutes for it and these have been found in lime and sulphur, and in a new material known as Sulfocide, made by B. G. Pratt Co., of New York; and other preparations are being put out. Arsenate of lead may be used with lime and sulphur, but only Paris green with Sulfocide. Along this line of work we need more knowledge.

From some unknown cause, all spray materials have done more or less damage to foliage and fruit the past season. The spring was unusually wet and cold, and the fruit and foliage were more tender and susceptible to injury from chemicals.

For summer spraying, 1 gallon of lime and sulphur to 35 gallons of water should give good results, and 1 gallon of Sulfocide to 200 of water, for apples and pears, and 1 to 300 for

fruit rots, later in the season. For the apple scab, these sprays should be applied after the blossoms have fallen, and again in ten days.

New England has excellent soil and climatic conditions for the production of high grade apples. It is only necessary to use the better methods required to meet the greater exactions of the markets of present times, when every acre of land devoted to orchards will bring satisfactory returns to those who possess them.

With the educational work that is being done by this State Association, together with that of the other organizations of the State, Maine may in the future more than double her orchards, and the income that may be derived from them.

PRESIDENT TWITCHELL: Maine is fortunate, ladies and gentlemen, in the man who has been selected by the Commissioner of Agriculture to stand at the head of the department of entomology at Augusta; a man who has been trained from his boyhood through innate love for the work; a man who has been ready at all times to answer any call and to assist anywhere and everywhere. This meeting could not have been the success it is but for the services and the co-operation of this official, and it gives me great pleasure, as one of his associates, to present him as the speaker of the evening—Prof. Hitchings, a good worker for the promotion of pomology and protection from our insect pests.

## A HALF HOUR AMONG MAINE ORCHARDS IN 1910.

Illustrated by Stereopticon.

By PROF. E. F. HITCHINGS.

(Extracts from stenographic report.)

In regard to this movement for better fruit—as many of you know it started with the New England Fruit Show last year and that movement has spread in one short year so that its influence extends, I think, from Maine to Oregon. It surely covers New England and our sister states New York and New Jersey.

We have among our fruit pests here in Maine one of the most common, and one that does perhaps the most serious damage to our fruit directly, the codling moth. In the picture before you, a female is seen in the act of laying her eggs on the apple, and an enlarged one by the side showing somewhat the colors of this moth, the adult insect. I will not take time to give the life history of this insect because it is familiar to you all. We must spray our orchards at the time when the fruit is erect as you see it, and the calyx cup open, to destroy this pest that does so much injury to our fruit.

The apple is here divided showing the work of the larva, the young of this moth, as it has done the work and emerged from the apple.

Here is a highly magnified illustration of the complete, fully developed larva before it goes into its cocoon to change to the adult insect.

Another pest that has done so much damage here. This is the curculio, the apple showing the crescent-shaped impression made by this beetle in the act of laying her eggs.

The next slide represents the adult insect highly magnified, showing quite a formidable insect.

Next we have the so-called railroad worm or trypeta, the adult being a two-winged fly about half the size of the ordinary house fly; the young of the same is shown at the bottom of the slide. The only way to control this pest is to keep sheep or hogs in the orchard, or to pick up the fallen fruit and feed it to the stock.

This is an insect that is familiar in the larval stage, perhaps not so much so in the adult stage, the borer. This beetle lays her eggs near the ground, the young of which remains two years in the tree. A very serious pest in some sections of the State.

We now come to the pest which has been so abundant this year, the so-called fall web worm. It has never caused so much destruction in any season before, as far as we know. This is the web made by the caterpillars.

The next slide will show you the adult caterpillars as they appear on the twigs; they are quick, active fellows.

The slide following shows the adult moth in the act of laying her eggs on the under side of a leaf. The moth is very similar to the so-called brown-tail moth, appearing about the same time,

of similar habits, flying at night as most of our moths do, and depositing her eggs on the under side of the leaf, these appearing in a flat greenish cluster, covered with a white bloom.

This picture represents the pear covered with the so-called San Jose scale—a pest that has not reached Maine to any extent although this summer we have discovered it in three new sections. Before we have only known it to be in one orchard in the town of Limerick where it has existed for eight years, and there by proper spraying and treatment this year we think we have controlled it. While inspecting a Gregory orchard the other day my assistant found a tree infested with the living scale. A report has come to me of a tree infested at Northeast Harbor, and I found one in Gardiner this summer. These last were both dead. Although we have not formerly had this pest, while our neighboring states have been badly infested, we must be on the watch to destroy it, for it is the worst pest that can come to our orchards.

We now come to the brown-tail that has been mentioned tonight, a caterpillar that infests Maine more than any other New England state. Coming first to Massachusetts, it spread to Maine and today we have over 8000 square miles infested with this insect pest. It is, as you learned, easily controlled in the orchard. You never need have a single fall or winter nest of brown-tails if you treat your orchards properly by spraying with lead arsenate toward the end of July or the first of August, directing the spray on the under side of the leaves. You will then destroy the little fellows before they make their winter nests.

The next slide will show a cluster of the adult moths, the male and two females. The next shows the female in the act of finishing the cluster of eggs, a brownish deposit about the width of an ordinary lead pencil and from an inch to an inch and a quarter in length. This egg cluster may be found if you examine your orchards in the latter part of July.

Now pass from these pests to another condition in Maine. The winter of 1906-1907 has been referred to as being the climax of injury to Maine orchards. The condition shown here is of an orchard of perhaps four hundred trees, the picture being taken, as you see, in the summer time, and yet there are no leaves on the trees; an orchard completely destroyed in



that one winter of 1906-1907. We had about a thousand orchards inspected and from examinations made under all conditions of slope, drainage, and soil conditions, we found that the Northern Spy and the Tolman Sweeting were the two varieties that stood up the best under all conditions. Since then we have been working along those lines and preaching the use of either the Spy or the Tolman for a stock for Maine. This orchard has been removed. There were just one or two trees that lived out that season—an orchard of good bearing age and productive.

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This slide shows a tree affected by canker, the picture taken a short time ago. It would have been in full foliage if it had been in a healthy condition. I took the picture in the month of September and you can see very scanty foliage. It is a type of one of those neglected trees which since that winter has been gradually dying, but if it had been treated properly it would be in a flourishing condition at the present time.

This represents one of the Gregory orchards, one out of about two hundred registered orchards under what we call the Gregory offer. This represents a portion of a lot of twenty-seven acres set by one man this year; he is standing by the side of the tree you see in the foreground. On each side is a cultivated section where he is raising on one side potatoes, on the other, beans; the section following is corn, next buckwheat. When I was there to inspect, this was the condition—two teams ploughing in the buckwheat that stood up to your knees, a dense growth. This view shows some of the nursery stock purchased for Maine. We have been trying to cut out such poor nursery stock and we have succeeded this year in eliminating one nursery that sold at least 10,000 trees last spring here in Maine. This nursery cannot secure another agent in Maine because our agents have to be licensed. We received word the other day from this agent who sold these trees, asking for a renewal, and we wrote him that under the circumstances we could not grant him a license. This same company has been doing business in New York State for thirty-five years.

This represents a nursery of one year whips as we call them. Much of the nursery stock comes from France, and is budded the first season. This shows the result of the one year's growth,



the next slide shows two years' growth in the same nursery, and the one following three years' growth.

In our experimental work we have been attempting to establish, just as our speaker has demonstrated to us today, the value of special stock, and we have at home what we term selected stock. We have scions growing from the noted \$50 Spy tree, from Uncle Solon Chase's orchard. We have the so-called Lowell Baldwin, a strain of Baldwins, the finest in the State. We have Wealthy stock selected from right up in God's sunlight in the top of a tree that has borne the best crops of Wealthy apples for the last ten years. And I believe that is the way for us to work. I hope you will all take the lesson that was given you this evening, and when you are top-working your orchards select your scions up in the top of the tree, don't reach for them on the ground; get the best that there are and set them as selected stock.

We now have a Lowell Baldwin scion, set this year. The scion has made a growth of three feet this season, and fully ripened, to the tip. This is one of many trees in an experimental plot that we are trying and every Lowell scion set this year has made that stocky growth. And that is what a selected stock will do. You dairymen don't go out and buy scrub stock. Why do you set any old thing for a scion in your orchard?

Here is an ordinary cold storage building that any farmer can construct, showing apples that are hauled in and kept in storage waiting for a better market.

This represents a cold storage plant, probably the most noted in the world, at Hilton, N. Y., fifteen miles north of Rochester. About thirty farmers united to build this cold storage plant. It was completed last year at a cost of \$120,000, and has a capacity of 65,000 barrels. They can keep the temperature in the upper story as cool as in the lower, and that will average anywhere from 30 to 32 degrees the year round, if they want to keep it there. They charge 40 cents a barrel for storage for apples. That is what they are doing in this little section.

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The last view shows you something of Nature's painting. The blossoms and fruit here shown can only be fully appreciated and enjoyed by those who are near to Nature's heart.

## THURSDAY—9.00 A. M.

The annual business meeting was called to order by President Twitchell. The secretary made his report as follows:

*Mr. President, Ladies and Gentlemen:*

On January 13th there was an executive committee meeting at the Elm House, Auburn; Mr. Leland, Mr. Hitchings, the president and secretary being present. The premium list was revised and other business done relating to the coming year's work.

A committee from the executive committee was chosen to select a place for the annual meeting and to secure special premiums.

Through the efforts of the president and a committee from the Auburn Board of Trade a long list of fine prizes was secured for the present Exhibition.

At the present time the Society has a membership of 124 life members and 60 annual members.

It seems hardly possible that a larger number of fruit growers cannot understand the necessity of joining an organization representing such a large and important industry as does the Maine State Pomological Society, not only for the influence it would give the Society in many directions of work, but for the education the Society can give the fruit growers. The larger the membership the larger the educational benefits will be.

There has been no field meeting held during the year, as the officers of our Society thought the State was so well covered with fruit meetings and other gatherings that a field meeting would hardly be necessary. From the inquiries coming from many places I think some means ought to be devised by which we can hold a field meeting at the Experiment Farm or some other place where the fruit growers can see and talk over practical things relative to the industry. If we could meet where the different methods of cultivation and spraying were used the lessons would be more lasting.

In conclusion let me suggest that as we are about to enter upon the opening of a Legislative session all the members not only use their influence for the enacting of such laws as will be a benefit to the agricultural interests of our State but see that no laws are enacted that will be an injury to our cause.

Respectfully submitted,

E. L. WHITE.

Voted, that the report be accepted and placed on file.

The president appointed E. L. White, T. M. Lombard and Will E. Leland a committee to receive, sort and count votes.

The following officers were elected for 1911:

President—G. M. Twitchell, Auburn.

First Vice President—H. L. Keyser, Greene.

Second Vice President—G. L. Palmer, South Livermore.

Secretary—E. L. White, Bowdoinham.

Treasurer—E. L. Lincoln, Wayne.

Member of Executive Committee for three years—Will E. Leland, Sangerville.

Member of Experiment Station Council—R. L. Cummings, West Paris.

Representative from Maine to the New England Fruit Exposition—E. F. Hitchings, Waterville.

Voted, that a committee of three be appointed to attend to the matter of the selection of a Board of Trustees and that this Society endorse their action.

The following committee was appointed:

George A. Yeaton of Augusta,

E. E. Hardy of Farmington,

F. H. Morse of Waterford.

H. L. Keyser, chairman of the Committee on President's Address, made the report for that committee and it was accepted.

Voted, that the executive committee with the president and secretary be a committee on legislation to secure such amendments to the present law as may be deemed advisable and such further enactments as may seem necessary.

Committee on Resolutions made the following report:

*Resolved*, by the Maine State Pomological Society, assembled in the city of Auburn, that we appreciate the cordial reception that we have received and wish to acknowledge the courtesy extended by Maine Central Railroad and Grand Trunk Railroad in granting excursion rates to all wishing to attend this meeting.

*Be it further resolved*, that we extend our thanks to the business men and citizens of Auburn and Lewiston and to the Maine Central Railroad for the excellent special prizes offered.

*Be it further resolved*, that we extend our thanks to the said railroad for establishing a flag station at Highmoor Farm, as the Society requested them to do one year ago.

JOHN W. TRUE,

V. R. GARDNER,

*Committee.*

Voted, that the report be accepted.

Welton Marks Munson came to this State in 1891. He died in Howell, Michigan, in September, 1910.

He was a life member of this Society and for fifteen years actively connected with its work. During these years he was not only one of its faithful and energetic workers, but as Professor of Horticulture at the State University and Horticulturist of the Experiment Station spent a large part of his entire time in serving the fruit-growing interests of the State.

While we bow to the Divine Will that has called him to a rest from his labors, we deplore his loss and seek in this way to pay some tribute to his memory.

V. R. GARDNER,

JOHN W. TRUE,

*Committee.*

The Board of Trade of Augusta extended an invitation to the Society to hold their annual exhibition in that city in 1911.

## SMALL FRUITS AND HOW TO GROW THEM.

By WILFRID WHEELER, Concord, Mass.

*Mr. President and Friends of the Maine Pomological Society:*

I have enjoyed coming here very much, and seeing the great improvement in the fruit that is exhibited over that which I saw four years ago when I was here at a meeting in Gardiner. The improvement is so marked and so fine that I cannot refrain from speaking of it, especially the improvement in the packing of apples. We have a great deal to learn along that line, and it is these meetings, the meetings of the New England Fruit Show and these local meetings, that are going to do much for

the fruit business in New England. I want to digress just a little from my subject and say that I think we ought to feel that all the New England fruit that is grown—the good fruit, I mean—ought to be grown and packed as New England fruit, not as Maine, or New Hampshire, or Massachusetts, or Rhode Island or Connecticut fruit. I think we have got to make this a point in this section of the country, and have the fruit go out as New England fruit and not as State fruit, because by the latter method we are going to divide the market up so that a person will be calling for Massachusetts fruit, or such and such a fruit, in the foreign markets, thus making a complex situation and not giving the right idea of the matter at all. But when we can get down to a good standard of fruit and a good packing standard, then I think we ought to grow New England fruit. Just before I left home the other day, to show the reputation Maine fruit has in Massachusetts at least, my little boy came to me and said “Dad, I want you to bring me some of those nice Maine apples.” Evidently he appreciates good Maine apples, and I know we all do. At the same time, there are good apples grown all over the New England States. I have found them in my work this summer in Massachusetts; I have found apples growing at the extremity of Cape Cod where the sand is so deep I don’t believe anybody could get to the bottom of it. I found them growing up in the Berkshire hills in the highest altitude we have in Massachusetts. I found them growing right in the city of Boston, and all over the State. And where the trees are being cared for in our State we are getting splendid fruit. So I don’t think the question of locality counts nearly as much as the question of the men. I think that idea ought to be extended more, that it is the men who grow the fruit who really make it. The locality counts for something, to be sure, but I think that is of minor importance, if a man has his heart in the business and is doing it in a proper manner.

Now this subject I want to take up this morning, the subject of small fruits, is just as important as the subject of the apple and pear and the large orchard fruits is, to a good many. One of the particular things that I want to emphasize is the adaptability of the group of small fruits, composed of the strawberry, raspberry, blackberry, currant, gooseberry and a few others



which are of minor importance, to growing in young orchards. We have always a problem in starting a young orchard to know just what to grow in it. Most of us agree that the young orchard should be cultivated thoroughly for at least four or five years so that the young trees will get a good start, and it is often a question of getting some crop that will pay while the young trees are coming into bearing. I think there is no crop that will pay better, especially if you are near a market where perishable fruits can be handled, than small fruits. And if you are not near a market, I think it would pay in districts like those we have in Maine and the northern parts of New Hampshire, where there is a special section adapted to the growing of these small fruits, to start canneries, so we can put them up and send them off in preserved form and realize nearly as much money out of it as we would by selling them in a fresh state. The small fruits all adapt themselves nicely to growing among young orchard trees, especially those fruits which require the same kind of cultivation and to which general orchard operations can be applied. The strawberry should be grown perhaps only for a year, or for a second year at the most, because it requires longer cultivation during the growing season. The season over which cultivation extends with the strawberry is too long for general orchard cultivation, so that I would advise planting strawberries only for the first two years, and then keeping them well away from the young trees. A couple, or perhaps three rows or four rows, through the orchard would be plenty, whereas you could plant bush fruits between the trees and use the land up very well with them. That is a very important thing to consider in our young orchard planting.

Then another thing, the general adaptability of small fruits to cultivation is a further recommendation for them. Not only for commercial planting but for the home garden they are very essential. Everybody who has a small garden, I don't care how small it is, can grow some of these fruits. I have a friend in Dorchester, Massachusetts, who has a garden of a very small area, yet he grows practically all the small fruits. He has gone to the extent of planting his strawberries in a barrel, by boring holes in it and filling it with soil, and he has had very good crops from that barrel, enough for his small family during the season. This shows what one can do if he has only

a small city back yard. Currants, gooseberries, raspberries and blackberries will stand a good deal of shade and that is a great recommendation for them. It seems to me no one should be without fresh fruit on his table when these fruits can be so easily grown. I feel particularly sure that every one ought to grow the strawberry, it being a fruit that we can have over such a long season now, beginning with the middle of June in most sections. By using a variety which is an ever-bearing variety, Pan America, we began picking the middle of July and the last berries we had just before the heavy frost about a week ago. This shows that you can extend the season of these small fruits almost as long as any of the small crops can be grown.

The strawberry, the most important of the group probably, is adapted to more kinds of planting and to greater latitude and longitude, than any fruit that is known today. It grows in the highest altitudes and in the lowest valleys, and across the continent from east to west, and in South America, Europe, Asia,—it has been found in practically all parts of the world. And so it can be generally cultivated, probably more than any fruit that we know of, and should be grown more universally than it is at present. I believe a question of markets generally determines the growing of the strawberry, but so many of us have neglected to develop our own local markets that that is one of the reasons why we fail to grow them. We feel we cannot ship them long distances and perhaps we ought not to do so. Take a market like Boston, for instance. It is apt to be filled with strawberries from all over the country, and nine times out of ten the sections that are shipping to Boston are not supplying their own markets. Grocers and provision men are going to Boston and buying strawberries and shipping them back. No wonder they are not fit to eat. That is one of the important things that we have got to look up, the market in our locality, before we go into the raising of any of these perishable fruits. If the market can be developed, do it, and get a reputation in your own locality for growing good fruit, and I think the development of it is just simply a question of whether you keep up to the locality or not, because every locality wants these fruits. It is a matter of whether they can get them good or not. I find if we can send a limited number of

very fine berries, particularly strawberries, into Boston, there is no question about disposing of them. It is the large quantity of poor stuff that comes into the market that overstocks it.

Now I said the strawberry would adapt itself to almost any location, but, at the same time, in choosing a situation for the strawberry I would get one where the land has a slight slope to it. It does not make so much difference which way the slope is—I would prefer not to have it directly north, and south would be a little too hot. Southeast, southwest, directly east or west is all right. But the great trouble with perfectly flat land that has no natural drainage is that the water will stand over the plants in the winter and you will get a great deal of winter-killing unless you devise some means of getting rid of that surface water. So in choosing a location, get, if you can, natural drainage of the surface, and if you cannot, improve it by artificial drainage. The strawberry responds to artificial drainage very nicely. As for the character of the soil I don't think it matters a great deal. I have seen the strawberry growing on Cape Cod, just as clear beach sand as you can get anywhere; I have seen it growing in other sections in New England, particularly in the southeast in clay, and in the heaviest black loam in the west. It does not seem to make much difference provided you can give it a certain amount of cultivation and the general care that the plants require. So I would not say a great deal about soils, providing they have got at the fruiting season the necessary amount of moisture in them. That is the test of the whole thing finally, because you can grow plants in any kind of soil, whether it is dry or wet, or gravel or loam, but you must have a place where there is plenty of moisture at the time the plants are fruiting, to ripen the crop. So in choosing a location, consider that if you cannot water the plants.

But the preparation of that soil is a very important point. I noticed Mr. Powell said yesterday that the preparation of orchard soil should be thorough. Well, if that should be thorough, I think the preparation of the soil for any of the small fruits should be more than thorough, because that counts practically all in the future cultivation. You can prepare the soil partly, plant strawberries in witchgrass and different kinds of biennial grass roots, and the amount of labor you put on to

that land in getting rid of those weeds after the plants are set will more than offset any gain that you can get. Whereas if the soil is perfectly prepared, no biennial weeds in it, no great amount of weed seed left, then you can take care of the soil with one-half the trouble and with a great deal less trying circumstances than you will where the soil is not well prepared. I like to plant strawberries as often as I can in land that has never had strawberries before, pasture soil or land that has been in grass for a number of years, broken up at least a year before I am ready to set plants. This is a very good plan for all the varieties of strawberries,—breaking up land in the spring, or two falls previous to the setting. The sod should be ploughed deeply and the land thoroughly harrowed the first year, and the first year's crop should be some crop that will stand a great deal of heavy cultivation, like corn, or potatoes, or beans. If the land is not in shape to plant any crops, use some such crop as buckwheat or clover or some of those crops that can be ploughed into the land and give it humus and put it into fine mechanical condition. This preparation applies not only to the strawberry but to all the small fruits. I know of no worse kind of soil preparation than to leave piper grass roots to plant currants and gooseberries in. I came across a place last summer where a man had set quite a large orchard and the land had not been thoroughly prepared. It was full of piper grass roots, and in among the orchard trees he had set gooseberries and currants, and the piper grass as we call it—it is witch grass in other places—was coming up so thick among the roots that it would be almost impossible at the end of the season to take care of those bushes. If any one has had any experience in killing that grass he knows how almost impossible it is to get rid of it even with clean cultivation. So the preparation for any of the small fruits should be as thorough as possible.

I always believe in setting strawberry plants in the spring for commercial purposes. In the garden I think the setting in the fall is very good, because oftentimes when your vegetable garden begins to go by about the first of September you can set strawberry plants and get some return from them the next season. A friend of mine who lived in Porto Rico told me that he could set strawberry plants in Porto Rico and have fruit in three months. I told him I could do it here in six weeks. He



looked at me in astonishment and surprise. I said, "That is very simple; we set our strawberry plants from the first to the middle of May and get ripe strawberries on them any time during the fruiting season in June, provided we want to do that." But it is a tax on the plant. And whether you set in rows, matted rows or hills, is a question of how your land is, or a question as to whether you want to raise a large quantity of nice berries or a large quantity of poor ones. I believe absolutely in setting strawberries for fruit in hills, that is, not exactly the way we used to set them, two or three feet apart and then a row for the horse to cultivate through, but beds where the plants are set from fourteen to eighteen inches apart in the bed, three or four rows according to the width you set the plants in the rows. In that way you give the plants a good chance to develop evenly all around, you get a bed that you can cultivate with practically very little expense, and a bed that in the long run will produce almost twice the amount that matted rows will. Then of course there is the narrow matted row or the hedge row, which again is far preferable to the wide matted row you so often see in strawberries. The advantage of the hills, in the matter of cultivation, over anything else is that you do not have to do much of any work about weeding or caring for the plants or taking runners off. In this way I have cultivated practically half an acre each year in hills and have not had to do any hand pulling of weeds whatever. The beds are cultivated the long way with the wheel hoe and across with the hand wheel hoe. The plants are set regularly in square blocks so we can go across the whole bed one way and then the other way with the wheel hoe, alternating the kind of wheel. We can keep that land practically clean and a dust mulch on it which will conserve the moisture and in dry weather we have no difficulty. I use for the hand hoe a Planet Jr. and a Daisy hoe; one has a flat plate like a hoe, the other very fine teeth. We run the teeth one way one week, and the other way the next week, alternating with the scuffle hoe, as it is commonly called, and in that way we keep the ground in the most perfect condition mechanically. I have seen the time this summer when we have had periods of two months with no rain whatever, and our land is apt to dry out, and the strawberry plants did not suffer the least bit. I almost gave up the strawberry business



because of the hard work there was in caring for the plants, weeding, cultivating, etc., after they began to make a mat of plants in the row. It was almost impossible to get men to do this work properly, particularly the setting of the runners or the pulling of the runners. Now the question comes down to simply pulling the runners off, and the ordinary Italians we can hire for \$1.50 a day do that work just as well as a man who has been trained in the business can in setting the runners or pulling part of them off in the matted row. In the hedge system where you set only a few runners, that is easier than in the wide matted row. But if you are going to grow for good fruit keep the plants in hills, or keep some of the runners pulled off in the hedge row, so you will have more sunlight around the plants and consequently larger fruitage. From plants in bearing the first year in hills, we picked in some cases a quart and a half and the strawberries would average over a quart on such varieties as Glen Mary, Sample, Minute Man, Meade and Abington. From plants set in this way in hills, from 26,000 to 28,000 to the acre, according to the distance you put them, I do not think it would be out of the way to say that 20,000 quarts can be grown to the acre. Some claim as high as 30,000 to 35,000. You can not get every plant to yield exactly the same amount, any more than you can get every tree to yield the same. I believe that any one who is going into the business should plant strawberries in this way on a small scale. One-third of an acre or a quarter of an acre planted in this way will produce more fruit and require less attention than an acre of matted rows of any other system that I know of.

Now the variety of the strawberry you will grow depends entirely on the market to which you are going to cater. I have stated at different times that so far as the quality of the strawberry is concerned I don't think the difference amounts to anything. I think it is simply a matter of letting the fruit ripen. If you want to get strawberries for your home table, grow any of the varieties—I wouldn't pick out any names and say one was better than another—it is simply a matter of letting them get ripe. We are so apt to go out and pick the strawberry just as soon as it begins to grow red; the first of the season we never get a high quality of fruit. But if you go out at the end of the season every strawberry you pick tastes good. I fail to

find any variety that will not be very good if it is thoroughly ripened on the plants. A friend came to me this summer from Amherst, and in tasting the different strawberries as he went across the bed, he asked me the different varieties as he came to them. He came to a kind which has always been considered one of the poorest quality berries we have, but it happened that at this time there were a good many very ripe berries on it and he pronounced it the best of the whole lot, and when I told him it was Glen Mary he seemed very much surprised because he said it had always been a very poor quality berry with him. I said, "Let it ripen thoroughly, the green tip becoming a good dark red, and there is just as good quality in that as in Marshall or Senator Dunlap or any of those varieties which we all consider very high quality." So for the home market grow a berry that is bright, that will not turn black, and a berry that has not a white tip. For a market a long distance off you have got to take into consideration that you must have a berry that will stand up. I think that no kinds have proved better for that purpose than the Glen Mary and Sample, for New England. I know in Maine and parts of New Hampshire the Warfield is a very good berry for ordinary purposes. With us it is apt to run small after the first picking, and I would not recommend it as a general thing. Of course you often-times find localities where one variety will do well and another will not, but I think Glen Mary has done very well all over the country, and should be planted very extensively, particularly for a berry to ship. For the home garden I would recommend Abington, Meade, Bubach, Parson's Beauty, Senator Dunlap, Barrymore and Minute Man. The Parson's Beauty is a very good quality berry with us, though it is apt to be rather light colored. Down on Cape Cod they grow the Marshall. They grow it very well in that sandy soil and often get it into the market before the other varieties come around us, and then it sells for as high as fifty cents a quart. So that is their one berry that they make money out of. While they do not grow big crops they get very good prices. I know a man in Marshfield who has a great many of them, and last season his Marshalls averaged him 22 cents a quart, where ordinary berries I think last year averaged less than eight cents. The variety is largely a matter of the market you are trying for. If you

can work up a trade on a certain variety, stick to that. For shipping distances try some of the firmer berries, for the home market some of the finer quality, perhaps softer berries. The summer care of a strawberry bed after the plants are set is very simple—thorough cultivation in order to keep the soil well stirred up on top and give that dust mulch which retains the soil moisture so splendidly.

Fertilizing with us is done after the plants are set. When I plough the land the first time, if it is old land, I generally manure very heavily at the time of ploughing, and if that land has been fertilized with manure in the fall, that manure is well mixed with the soil so when it is ploughed in the spring prior to setting the plants it turns up in good shape and is where the plants can take it. I don't use any commercial fertilizer at all. I simply use chemicals, mixed or straight as the occasion may be, always applied to the plants as they are growing. We use a great deal of basic slag, dissolved bone black and sulphate of potash. Our soils do not require any of the very strong materials like nitrate of soda, but we use some tankage. Any of those chemicals applied very lightly in frequent doses will grow a better plant than to put the fertilizer on all at once. It is better to apply these fertilizers during a rain than when the plants are dry. I believe in frequent cultivation and fertilizers in small doses rather than a large dose of a chemical or mixed fertilizer at the time of setting. I have seen many beds hurt at the time of setting by putting plants in soil that has been heavily manured or fertilized. There is too much manure at that time and during a dry season the plants are apt to dry out before they get well rooted. If a great deal of fertilizer has been used, the small white roots of the plant are simply burned by it, or injured in some way.

In regard to the plant itself, you can take plants from your own grounds and set them the same day that they are dug. On plants that are shipped to you or that you buy from a distance, the roots should be cut very severely. As a rule in shipping, plants are more or less dried out, and the tips of the long roots are apt to be a little hard, so in setting they are liable to be doubled up, therefore the shortening of the root at least one-half, and the top in proportion, is very essential, particularly if the season is dry. The plant will take hold of the land a

good deal quicker when the roots are shortened to that extent. As I said, frequent cultivation is absolutely necessary, and the more frequent the better. In dry weather such as we have had this season we always plan to cultivate twice a week in the beds which are in matted rows, and run the scuffle hoe and the wheel hoe through the hills at least every six days. Frequent cultivation seems to be the salvation of the plant in dry weather. Cultivation should not be carried on too late. It should cease as early as the 10th of October. In that way the plant gets a chance to harden its foliage a little better and to ripen off for the winter. We don't very often hear of winter injury to plants, because the snow and the protection we naturally give them keep them from severe injury; but at the same time if you get a big mass of foliage in the fall just at this time and then put on a cover, you are more likely to do the plants injury than if they were hardened off by stopping cultivation early in October. In our climate we cannot depend on the snow covering the plants. There must be some sort of winter protection, like the common wild grass that we get on the meadows, or leaves, or pine needles. Care should be taken in the use of these things not to cover the plants too deep. They are naturally hardy and need only enough protection to keep the ground frozen in the spring, when we have warm days (when the ground thaws out and breaks) and very severe nights. Freezing in March is what injures the strawberry plants more than any other cause I know of in climatic conditions. I have seen sticky ground that would crack open an inch during that month, and of course the roots of the plants have got to break, as the power of the frost is very great at that time of the year. So keep in mind that the idea of the mulch is not to keep the plants warm, but rather to keep them cold during that early spring season. In our section we generally uncover the plants about the first of April and then we are very safe because the weather after that time can be pretty well depended on. Our early fruiting varieties like the Marshall I would recommend keeping covered a good deal later than that to prevent early blossoming, because the Marshall is a variety that is very easily frozen, and the blossom starts earlier than any of the others.



In the spring as soon as the plants are uncovered and thoroughly thawed out, they ought to be cultivated pretty well to keep the ground in good condition, and at this season a dose of wood ashes and bone is a very good thing for the plants. I would not recommend any highly nitrogenous fertilizer at that period unless the plants lack foliage. If they do, put on some stimulating fertilizer like nitrate of soda. That ought to be used at the rate of not more than 250 pounds to the acre, applied in three doses, mixed with something like loam or sand and distributed fairly evenly. If it is applied just before the plants are in blossom or at the time there is green fruit on them, you are apt to get a large berry, very insipid in character and with practically no quality to it at all. So if you can keep it away from the plant at that season, all the better. Try to grow your foliage the year before, and never use any highly nitrogenous fertilizer in the spring. But generally potash and phosphoric acid ought to be given in some mild form. Wood ashes, bone meal, or a little dissolved bone black is a very good thing to use at that time.

Now the question of picking comes up very seriously to many of us, because oftentimes we grow more berries than we can pick. Again you have got to consider your locality, how you can manage help at that season, because if you cannot get help to pick the berries it is no use to grow them. We have to employ the Italians now a great deal. They are the best pickers we can get. We are trying to eliminate the children, that we used to have, because they do a great deal more damage as a rule than good. They will pick for a little while very nicely but get tired quickly, and like all children they want to go and play for a while. But I find the Italians are the most satisfactory help we can get. They will work fourteen hours a day during the season when we are extremely busy and they pick the berries very carefully. We always pick in two qualities. And there is something I want to emphasize very strongly. All berries that are to be sorted should be sorted in the field, never handled twice. Each picker should always take two baskets and pick the poor ones into one and the good ones into the other, and in that way the berries are handled less and they are in better condition when they arrive in the market, even though the market may be very near by. Take a box that has



been rehandled and look on the inside of it and it is practically red with the juice of the berries that have been bruised. So be sure to have all the sorting done in the field. In the picking of fancy berries you have to be very careful that whoever does the picking, handles the berries with the stem. That is one of the things we have to be much more careful about than we used to. The berry should be broken from the plant by the stem and laid in the box without touching it at all. In that way we can get the berries to market in splendid condition.

The matter of packages I consider is one of the most important things we have to plan for. We should have clean new boxes made of white wood—the very best quart baskets we can get are none too good, and I object very much to the use of the secondhand crate that we have to use, or do use so much in New England. In our own town I think practically one-third of the berries are put into these secondhand crates, and those are generally the poorer berries. In some cases some of the growers make three qualities. The better qualities are packed either in a ten, sixteen or twenty-one quart tray, and in those trays the berries are carried in to market so that there is no layer above them. Each box sets above the other and is cleated so that it does not set into it. In that way practically all the better quality berries in the vicinity of Boston are handled in the market and bring anywhere from three to ten cents a quart more than the berries packed in crates. You know that in taking the berries out of a crate, 32, 48 or 64, you will find a good many of those in the lower tiers are crushed by the weight of the fruit on the carrier between them. So I think in local markets where you can take from your own team into the market the use of some of those packages like the 21-quart tray particularly, that packs very nicely and takes the same space in width as the bushel box only twice as long, is to be recommended. It is being used in our section much more than the 32-quart tray. I have used a 16-quart tray which has two layers. That is a great improvement on the 32-quart for fancy fruit and looks a good deal like one of these apple boxes, not quite so high and a little longer. Then in all these packages we ought to have the same kind of a label that will show just the quality, the same as you would in your apples, and in that way we are building up a business which is going to call for more of that fruit.

I have not spoken much about the diseases or insects that bother the strawberries. There are not many and they are easily controlled. There are practically no diseases of the strawberry which cannot be controlled by spraying and it is a very easy plant to spray. Blight, leaf spot and fungous diseases respond very rapidly to bordeaux mixture. Practically the worst of the insects is the white grub. I know of no insect I am more afraid of than that, on the strawberry plants. But by the proper rotation of crops on the land you can practically get rid of it. It is not wise to plant strawberries right after grass. The land is apt to be full of the eggs of the white grub, laid by the ordinary June beetle, and you are likely to get them on your strawberry plants. So if you can get in a year between grass and strawberries with some such crop as corn, beans, or anything of the sort, you will be sure to get rid of the white grub. There is hardly any chance of its being in the same land a long time providing there are crops grown that it cannot eat, but strawberries after strawberries in a continual line is a very bad policy. Then there is the ordinary cut worm which we have to contend with, but I have found that spraying with arsenate of lead or Paris green will practically get rid of it. The cut worm comes up out of the ground as a rule and eats the tender leaves of the plant just in the early spring and spraying with some arsenical poison will dispose of this pest.

So much for the strawberry. The raspberry is probably not as important commercially as the strawberry, but still it is grown in great quantities in the West where in certain sections it is used for canning or drying. Here in New England we practically depend on the West for our fresh raspberries, and it is a fruit that ought never to be shipped any long distance. You see in the Boston market raspberries that come in there in very bad condition. The nature of the fruit is such that the least bit of weight on it settles the berries together and by the time they have traveled a couple of hundred miles, or even fifty miles, they have settled so they hardly half fill the boxes, and even by the use of pint boxes, or cups, one-fourth quarts, and all those different varieties of packages, we don't overcome this difficulty very much; so that the raspberry ought to be grown close to the market; more so, almost, than any other fruit. In certain sections it requires a good deal of winter protection,

but aside from that it is very easy to grow. I believe in setting raspberries in young orchards a good deal more than is done at present. Set them in hills not less than six to eight feet apart so they can be cultivated both ways. By putting a stick in each hill we can easily keep the canes tied to it and the plant won't be lying on the ground at the time of fruiting. With us almost every winter we get some winter-killing, and the canes ought to be laid down. I understand that here in Maine, with plenty of snow you do not need that sort of thing. I would recommend that the red varieties be planted almost exclusively. The black and the purple kinds, or the hybrids as we call them, are not as salable as the red varieties. The preparation of the soil should be just as thorough for the raspberry as for the strawberry. The planting can be done in the spring perhaps better than in the fall. When the cane is planted it ought to be cut back to the ground so that we will not get a growth started six or eight inches or even a foot above ground. We want the new growth to come from underneath. Oftentimes in planting raspberries, particularly with a person who has never done it before, they are allowed to branch out above the ground and they make no new growth underneath. That is true of the blackberry also. Cut them back to the surface of the ground and make them come up from underneath. The propagation of that particular bush shows this, because we can get the very best plants from root cuttings as they are called. The old roots are taken up, cut up into pieces from two to three inches long and planted out in rows and the buds develop along those roots and we get better plants than those ordinarily taken up as suckers.

The raspberry I think will probably stand more manure than the strawberry. I believe that fertilizer in the form of manure in the fall or early spring is the best. The addition of potash salt or wood ashes is also a great benefit in giving color and vigor to the plant. The raspberry is a splendid plant to grow in connection with the poultry business, because if you cannot cultivate for a few years generally the bushes grow together so it is almost impossible to cultivate, and it is a very good plan to let the hens run through those bushes, scratching up the weeds and eating the green stuff that naturally grows underneath, so that we get both cultivation and a good place for the

hens in hot weather. I have seen that done a good deal in the southern part of Massachusetts. A great many of the small fruit growers there have poultry in connection with their business. In that way they have made a great success with raspberries in a small way. The first year in raspberry planting, or blackberry either, if planted 6x8, 6x6, or something like that, a couple of rows of vegetables can be grown in among the bushes to give some return from the land while the plants are developing. I think that peas, carrots, turnips, cabbages or a similar crop are excellent to grow in this way, and as in all the small fruits you have to consider getting a quick return, this is one way to get it from the raspberry or blackberry, currant or gooseberry. I planted this year a good many gooseberries. I took enough early beets off the land to pay for the first cost of planting and the bushes. It didn't injure the plants the least bit. While they were catching hold the beets were growing and the land was fertilized highly enough to take care of the beets at the same time. So we can readily get some return from the land the first year, and with raspberries that bear the second year we ought to get a fair amount of return the second year, and if the pruning and cultivating are kept up they ought to grow to the seventh, eighth or even tenth year. In pruning, all the old wood that has borne should be taken out at once. It is not a good idea to leave it in, because insects and diseases harbor in that dying wood and are apt to cause trouble later on. A good many people leave the old wood in during the winter, thinking that the protection that wood gives to the plants is of some benefit, but I think the benefit is very doubtful and I remove both blackberry and raspberry canes after they have fruited, cutting them out with a good heavy pair of pruning shears. You will find that in pruning blackberries a person needs to wear a heavy pair of gloves.

The same rule about packages holds good in the raspberry and blackberry as in the strawberry. We have got to pack in clean packages, and in small enough packages so that the berries won't settle together very badly.

In regard to the varieties, here in New England there are no better red varieties than the Cuthbert, and possibly the Herbert which is being tested now a good deal. I have had it fruiting on my place for two years and am very much pleased with it.



It seems to be a hardy variety, of good quality, fine looking, not too seedy, and a berry that does not break apart like some of the new varieties we have had lately. I tried the Cardinal and found that while large and productive the fruit was very seedy and when picked was apt to crumble up. That was a great trouble with the Marlborough with us. It is perfectly hardy but the berry was so unattractive when in the market that it was discarded entirely in favor of Cuthbert. The possibilities in canning the raspberry ought to be looked into a little more carefully. A friend of mine who was traveling in the north of England a few years ago said that practically the whole of the north of England, near the line between Scotland and England, was devoted to the growing of raspberries, where they are preserved and kept entirely for the use of the English army. One of the contracts every year for the English army by the Government is for so many thousand pounds of raspberry jam. That is served to the soldiers in place of any other sweet substance, and they consider that the food value of the raspberry jam is higher than almost any other form of sweet that they can give to the men, with pure sugar. The English Government is very, very careful about this particular product, that there shall be no adulteration in it, that the jam shall be made from pure sugar and pure, fresh fruit. So these canneries have been started right beside a splendid market that would take every bit of the fresh fruit. There are thousands of crates of raspberries grown up there and during the fruiting season practically the whole of the shifting element of the cities in that section goes out and picks raspberries from six to eight weeks. So I think in our remote sections that possibility ought to be looked into a good deal more. We have not half developed the question of canning these small fruits in this country. You find today those canned fruits that sell for the most money in the largest cities are put up by women in their own homes. I know of two or three firms in Boston who handle quantities of these small fruits put up in the homes by women who make their pin money in this way. It ought to be done on a larger scale. If we could guarantee pure, fresh fruit, there would be no end of the sale of it. We import a great deal of canned fruit today from the other side. This ought to be grown and



put up in sections of our own country. Where there is plenty of good land it does not seem right to pay money out to other sections for fruit we can grow so easily ourselves.

The handling of the blackberry is so nearly like that of the raspberry that I will not stop very long on that, but I do want to bring up the subject of the currant and gooseberry a little more to you. I think that both the currant and the gooseberry are not developed in this country the way they should be. These last few years the markets of our large cities have been supplied with currants from New York, Nova Scotia, New Jersey,—everywhere but New England. I failed this year to find in the Boston market, enough currants to supply the market any one day, that were grown in New England. This is a fruit that ought to be grown more, particularly among the small trees, and it can be grown to good advantage here as well as in other states. I know in New York at the time the vineyards were planted there, a great many currants were put out, and at one time the market overflowed with them, but now things have evened up more, and besides more people are getting to use them. The foreign population require them, so we must grow them on a larger scale ourselves. Any good soil that is fairly cool and moist will grow currants very nicely. I would not advise planting them in light sandy soil, but a soil that has good depth and plenty of moisture and is cool during the summer will grow splendid currants. They can be planted about at the rate of 800 to 1000 bushes to the acre. And the same holds good of the gooseberry. In England where the gooseberry is at home and probably in its native element more than anywhere else, everybody has gooseberries as commonly as strawberries. The same is true in Germany and Denmark. They think the gooseberry is one of the finest fruits grown. We are apt to think of it as a little, sour, hard fruit, only fit for preserving. But I assure you we can grow just as good gooseberries of the large eating varieties as can be grown in England. I know of a young Danish fellow in Malden who has hybridized a great deal in gooseberries. He has produced a berry which runs almost an inch and a half long, has a very thin skin, and one of the highest quality berries that you ever tasted. He sent some of the bushes he has produced from this variety to his brother in Denmark where they know goose-

berries from A to Z, and there he was awarded a gold medal from the Royal Horticultural Society of Copenhagen for this particular variety. Here it would be impossible for him to be recognized. People would not consider a new variety of gooseberry worth looking after. But when they give a gold medal for a gooseberry in Denmark we certainly ought to recognize that there is some value to this fruit over here. I have found that this particular variety I have spoken of has produced on the place of this young Danish man at the rate of \$2000 to the acre. If he can do that, there are lots of us who have even better conditions than he has to work with and can certainly do as much. I find the common Downing which is grown so much in this country is practically the best one for marketing, because it can be marketed green and hard and shipped almost any distance. Nova Scotia supplies the Boston market almost entirely with these, and last year they sold at from \$2.50 to \$3.50 a bushel. At the rate of half a bushel to a bush you can see that is a pretty good crop. And it can be done here if it can in Nova Scotia. So I recommend, wherever you can create a market for them, planting some gooseberries and experimenting with them in a small way, particularly for your own use. The English varieties, like the Industry and Crown Bob are the best eating ones, while we have some splendid large American hybrids, the Columbus, Chautauqua and Pearl. And the Downing when it is thoroughly ripe is as nice today as almost any of the gooseberries. One great advantage of either gooseberries or currants is that you have not got to market them the day that they seem to be ripe. You can let them stand on the bushes almost indefinitely. I have picked gooseberries as late as the first of September that were in splendid condition on my place, and the week of September 8th I visited a friend of mine just south of Boston and he was still picking his currants. They had covered the bushes with a piece of cheesecloth to keep the hot sun off them. We do not make half enough of these small fruits. In some places there are a good many wild fruits that may take their place, but I think that in small cities and towns where we have to depend so much on the Italian fruit seller we ought to grow more of this kind of fruit for ourselves, for we can have such high quality and have it easily.

The pruning of both gooseberries and currants should be very severe, the old wood being taken out. As most of the varieties produce their very best fruit on the two-year-old wood, anything over three years old should be cut off. We are so apt to think a currant or gooseberry goes by in a very short time. That is not true if we keep out the old wood. I have bushes ten years old now and I think they are good for ten years more, by the way they look now. And we must not let grass, or sod, or heavy weeds grow up around them to take their vigor or in any way rob them. They need careful cultivation, clean cultivation, and there is no reason why they should not last a great many years. The reason so many currant and gooseberry plants run out is the fact that the grass has been allowed to grow in around them.

The same thing that was spoken of with regard to other small fruits holds true in marketing gooseberries and currants. They should be marketed in clean, attractive packages. Grow the large cherry variety of currant rather than the old fashioned Dutch varieties. The latter are so small no one cares for them for eating. Such varieties in the currant as Fay's, Cherry, Wilder and Perfection are the ones to grow. If you want splendid fruit for your garden, grow some of the white varieties. Some of them are very excellent. They are not as acid as the red ones, but very splendid eating for table use. I think there is no better summer fruit than a combination of currants and raspberries; thoroughly ripe currants and raspberries together on a hot day are the most refreshing of our summer fruits. I think we ought to go more extensively into this small fruit business, not so much perhaps as a commercial proposition at present, though working toward that end, but planting them in our gardens for our own home fruit and in that way getting rid of some of the poor fruit trash we get in the market.

I thank you for your attention.

MR. MERRILL OF AUBURN: I would like to ask Mr. Wheeler how near together he sets his strawberry plants in the hill system.

MR. WHEELER: Most of the plants are set in four rows 14 inches apart each way in the bed. And then there is a space of three feet between the beds which is used for a path and to

cultivate between with a horse. The plants that are set fourteen inches apart can only be cultivated by hand labor, with wheel hoes and hand tools. In some varieties which grow a very large plant I am setting only three rows, eighteen inches apart each way; but in either case making a bed about four feet across. In that way we can pick the plants from each side. We don't attempt to pick first on one side and then on the other; we pick two plants into the bed, each picker picking that way.

QUESTION: I would like to ask if there is any more danger of their winter-killing under the hill system than in matted rows?

MR. WHEELER: I have not found it so. You see there is enough foliage made by the plants to cover the ground completely, so that practically the hill system in this way is a wide matted row, with the advantage of having each plant by itself, so that when the berries ripen they lie right around the plant instead of being covered entirely by the immense quantity of foliage you get in a matted row. I find that one particular advantage in the hill system over the matted row is the ease with which you can pick the berries. In the matted row you have got to look all the foliage over to get the berries underneath; in the hill system the berries lie right round the plants, are easily seen and easily picked. There is no more danger, as far as I can see, of winter-killing than in the matted rows.

MR. MERRILL: Do you use the same varieties in the hill system as in the matted row?

MR. WHEELER: I prefer Glen Mary for the hill system over any other variety I have tried; possibly Sample is the second. The gentleman asked about Senator Dunlap—the great trouble with that is that it makes such an abundance of runners that it keeps you busy all the season pulling runners. I would rather not use that variety for the hill system, though it is a very good berry.

QUESTION: You say "pulling the runners." Do you pull them off?

MR. WHEELER: By putting your hand on the crown of the plant, you can take twenty-five runners in the other hand and pull them all off, pulling a little sideways so as not to break the crown.



QUESTION: When you are troubled with white grubs, do you reset other plants?

MR. WHEELER: Yes, when a plant is eaten out by a white grub, I reset another plant taken from another field, or in the hill system when a plant is missing, let the next plant make one runner to fill in that space if I haven't got plants to take out from another bed. Always reset them so as to keep the beds full. The white grub can easily be taken out; generally there is only one in a place. Even if there are a good many you can often save a bed by taking these pests out. I don't know of any insect poison, or anything of that sort, that will attack the white grub under ground. I have heard of the use of bi-sulphide of carbon injected into the soil where they are, but it would take a great deal longer to do that than to dig the grubs out.

## HANDLING THE FRUIT CROP.

By PROF. T. M. LOMBARD, Auburn.

I will confine myself to strawberries, though I believe a large part of what may be said about berries applies as well to fruit of all kinds, and in fact, to much of the market garden truck grown and sold in such quantities in these two cities.

Handling the crop is a large problem. In the first place, harvesting the strawberry is of very great importance.

Quite a proportion of the strawberries raised about here never find the market, having been destroyed by the knees or feet of the picker, or left on the vines to rot. Quarts of berries that do find the market, so far as looks go, have been ruined in the field.

To gather in a crop of three, five or ten thousand quarts of strawberries, requires about all the children in a neighborhood, and to do it properly requires a man able to control his whole picking force, and govern his own soul. Due consideration of little details is every time rewarded. Painsstaking care in the harvest attracts attention in the market places. A berry when picked should be immediately dropped into the box, never retained in the hand, till more berries are taken off. Once in the



box, *let it alone*. Berries picked and left waiting in the sun are sure to show the effects in the market. To me, small crates are preferable to large ones. I am not in love with any of the crates that are in use here. I would never have anything rest, or press on top of a box of berries of any kind,—especially the strawberry. New boxes should be used and these should hold one quart.

Most of our berries after they come to the market are roughly handled, and most shamefully exhibited. Before the wide open doors of commission houses, on tables and in crates outside our stores, are displayed for sale berries and fruits of all kinds, subjected not only to the dust and dirt of city streets but to the feet of the fly.

We bring to our market good berries, poor berries and good-for-nothing berries picked into the same box and packed in the same crate. Different sized boxes are in the market most of the time. Three-fourths of these boxes of berries are never found filled to the top when on sale in the store. Right here is where we, as growers of the berry, fail to do our part. Most of us do not fill our boxes, and none of us grade our berries. We as growers, having gathered our crops with all possible care, must grade them before going to market. Proper grading of crops will bring better returns both in cash and self-satisfaction. The day of judgment will surely come and he who does not grade his crop in an honest manner will wake up some day to find himself down the line.

Now, in conclusion, what do we need—what ought we to do to bring about better and more systematic market conditions everywhere? Active and honest commission houses are good aids for this purpose. Such houses, however, often become indifferent and careless, forgetting the real thing, and our products are left to the mercy of time, and finally dropped in a bunch to pedlers. Therefore, to my mind, better than all commission houses, better than the ability of any one man to sell his own crop, would be a genuine, up-to-date *Fruit Growers' Association*,—some co-operative organization to the headquarters of which we may take our berries, or fruit, and have them cared for and disposed of for us in a profitable and honest manner.

Many times our market price is much reduced by some fellow from the country, ten miles or more out. He comes here

with a load of berries. He has been on the road half the night, perhaps. Tired, anxious to get back home, knowing nothing of the market conditions he scatters his load over the town. Would not some organized selling place be better for him?

I have no favor for trusts. I am not talking about any trust company combined for selfish ends and greed of money, but true co-operation, pure and simple, that welcomes sincere competition and recognizes in each man who produces, the inherent or divine right to a just proportion of the price paid for that product in the market. Go into the creamery just over the hill. Notice what they are doing there. Set in motion a fruit packing and selling plant here in one of these two cities, and before long, in addition to its first and particular product, will be coming from inside its walls more by-products than can possibly come from any creamery in the world.

Organizations of some sort are springing up the country over. Can anyone give a good and sufficient reason why the fruit growers in this state or county, or town even, should not combine and co-operate. *Let's do it.*

## PRUNING.

HON. GEORGE T. POWELL: A number of questions have been asked this morning in regard to the proper pruning of trees. I was asked if I would give some illustrations as to how a tree should be pruned.

The question of pruning is a very important one. From the beginning, when you purchase your trees, they should be put in the proper shape for planting. That means that the roots should first of all be pruned. All the roots should be cut back at least one-third of their length, no matter what the size of the tree is. One-third of the roots should come off whether it is a large tree or a small one. That will be a very good proposition for the root system of the tree. Now it is very important in receiving a lot of trees that they be not exposed to the wind or the sunshine, because these delicate, fine roots are very soon destroyed by exposure. Hence let this work of preparing the roots be done under cover, in a shed or somewhere out of the wind and sun.

Take the entire broken piece off, no matter where it is. Then turn the tree around and begin to cut back one-third. The small roots don't need much pruning. The tree should be planted at least one inch deeper than where it was budded. That puts the tree down a little lower than it grew in the nursery.

Some nurserymen recommend not to prune the tops at all, but to set the tree out just as it came from the nursery. I don't believe in it, because the tree has a greater proportion of top to support than it has root to support it. The theory on the part of the nurserymen is this,—that you must have foliage to draw the sap, and hence if there is an abundance of foliage in the top of the tree it stimulates root growth. Well, that depends upon conditions. If there is a moist season, plenty of rain-fall, and an abundance of moisture in the soil, that tree will grow and support the whole top, but if there is a dry season following the planting, there will be ten or fifteen per cent loss when the whole tops are left upon the trees. I plant a thousand trees at a time and have not lost one tree out of a thousand, and my practice has been simply to go through and prune back at least two-thirds of the top—the roots one-third and the tops two-thirds—cutting down to a bud that shall have an outward growth. There is sufficient root, having two-thirds of the root and one-third of the top; there is no reason why a thousand trees should not grow when a thousand trees are planted. There will be sufficient foliage to draw sap. If this is planted next spring, there should be at least a growth of two feet by next autumn.

QUESTION: Would you cover these cuts with anything?

MR. POWELL: No, it is not necessary; so small a cut as these will heal over.

QUESTION: Haven't you found, having it so close to the bud, that in a dry season it will go back to the next bud?

MR. POWELL: If it does, I should re prune. Once in a while the bud may fail to grow. Then I should prune back as soon as I discovered it was not growing.

QUESTION: Was that tree propagated from a piece of a root or a full plant?

MR. POWELL: I should say that this tree was propagated from a whole root for the reason that I cut off a long tap root.

When you get the piece root trees you get a sort of one-sided root. A tree that is one-sided does not have the tap root formation, so this is a tree grown upon the whole roots, and a great deal better tree.

Here is a tree that is a little different. This tree is drier. It has been out of the ground a good while and it has dried a good deal, hasn't so much of a root. Now there is a tree that would want different treatment. I should prune that tree as lightly as possible, just clipping off the ends so as to save as much of the root as possible, just simply clipping these lacerated ends so we may get readily a new formation of growth from these roots. That is all I prune this for, to get a new fresh cut from the bottom of the root in order to start out a new system of root growth. Because of the absence of the fibrous roots there would be a question as to whether this tree would pull through or not, hence in order to insure the growth I would leave a little more. Now the root has the entire opportunity of forcing out a few buds, and if about three or four buds are forced out it will make a splendid tree, but if the whole top was left on nine times out of ten that tree would die because the root could not support so much top as there was on the tree. So these are points that one needs to take into account in receiving a lot of trees, in the matter of pruning, in order to insure the growth of every tree.

These trees illustrate the difference between a whole root tree and a piece root tree. There may not always be quite so much difference as this, but a great deal of the time the piece root tree will have a very light root formation, and I don't like them on that account. I would rather give fifty cents for that whole root tree than to pay ten cents for this piece root one. That would be my judgment as between the value of those two types of trees propagated as they are.

Now just a few points on how to prune after the trees have been set. I have on my farm at the present time about 10,000 apple trees and I am heading them all down within as near as I can two and one-half to three feet of the ground, which are really low-headed trees. For the first four years after an apple tree has been set there is very little pruning to do; simply take out a cross branch. If we begin to prune these young trees from the time we set them out, we are going to push the tree



forward too much into the air, we are going to get tall growing trees. In that way we sacrifice the tendency of that tree to produce fruit spurs early. Now if we do not prune these trees when they are young the tendency is to produce fruit spurs upon the low branches. As the low branches are growing out and upward the energy of that tree will constantly tend toward the development of fruit spurs upon the lower branches, but if we cut off these lower branches and keep pruning up, the tree is going to shoot up into the air and keep on growing, and will not develop the fruit spur system. So I don't like to prune young trees much of any for four years. At the end of four years we begin to do our pruning, beginning at the top, and cutting out all the branches that are inclined to grow up straight. All the lower branches that are growing in an outward direction are setting up heavy with fruit spurs, and there is no reason why we here in the East cannot under this system of management get young orchards into bearing in six and seven years profitably. There is where the West has the advantage of us,—they bring in their orchards so much sooner than we do here in the East, their orchards paying them well at five, six and seven years. We may not be able to bring our trees into bearing quite as quickly as can be done in the West, but there is no reason why we cannot do it in many years' less time than it takes at present, by this system of heading down our trees, after they begin to get four and five and six years old, still leaving the growth upward. Another point, in pruning the lower branches, prune to a bud that is on the upper side. In that way we change the tendency of the lower branch. Instead of growing outward and downward, the tendency will be upward. And by cutting back these lower branches, preventing a too long growth outward and downward, you are strengthening the growth of the branch next to the tree. Every time you prune to this upward bud, you are throwing the growth back and creating a strong branch. And I can actually cultivate my low-headed trees today that are eight and nine years old under this system easier than I can my high-headed trees pruned up four and five feet, because the growth in the low-headed trees next the trunk is so strong that it has held the branches up, while in the other case the growth has not been so strong and as they bear the limbs come down close to the ground. We have just as much



fruit on the ground from the high-headed trees, and I think even more than we have on the low branches of the low-headed trees, because of the upward growth of the lower system of branches on the latter.

## HOW I RECLAIMED A NEGLECTED ORCHARD.

By C. E. HARDY, Hollis, N. H.

*Mr. President, Ladies and Gentlemen:*

It gives me great pleasure to visit your fruit exposition and see such a fine display of apples as you have here today. It is certainly, for one of our New England States, a great exhibition and a grand success. When I see such an exhibition of fruit, it proves to me that the farmers of New England, and of the State of Maine in particular, are beginning to realize the possibilities that lie before them in the raising of fruit, and especially apples. Also when I see such an exhibition and listen to the remarks of the expert fruit growers who have been talking to you yesterday and this morning, it makes me feel rather small and out of place, to come down here from New Hampshire and undertake to talk to you in any way in regard to raising fruit, for I am not an expert in any sense of the word; in fact, I had but very little experience in this line previous to four years ago; and in the matter of setting out trees and raising fruit from them have had no experience whatever. But Dr. Twitchell asked me to come down here and tell the story of how I have reclaimed an old and neglected orchard, and that I can tell you in a very short time. It is simply the work of four years.

The farm in Hollis, N. H., which is now my home, is my old native place where I was born and brought up. I worked on the place as a boy and a young man for my father up to something like twenty-one or twenty-two years ago, when, like a good many young men, becoming dissatisfied with the methods that my father used in carrying on the farm, and also with a good deal of the work I had to do, I thought I could do better in other business. I stopped work on the farm and went into business, and from that time up to four years ago knew but

little about the work that was actually carried on on the place, although the old farm was still my home. I was not there during the day time, simply at night. Things went on in this way until the fall of 1906, when my father, who was growing old and feeble, requested me to take the place and carry it on to suit myself. This I consented to do, disposed of my other business, and took the place.

About the first work that was attended to was the harvesting of the apples. I remember way back in 1896, I think it was, my father harvested something like 1200 barrels of apples. People thought it was a large crop. But they were very poor apples, small and green, and he sold them and realized ninety-six cents a barrel at the station. That was a year of tremendous crops in apples. From that time on he declared that he would have nothing more to do with fruit, and paid no attention whatever to his trees,—simply had the fruit picked when the time came. In harvesting the apples in 1906 there were about 300 barrels that were in fairly good condition to sell as mixed apples. In picking those apples I found a good many trees the fruit on which was completely covered with San Jose scale, so that I had to shake the apples off and put them into cider; I found other trees that showed more or less scale on the fruit. While picking the fruit I did not know what the trouble was, but my son, who was then a student in the New Hampshire College taking the agricultural course, was at home for a vacation over Sunday and I brought his attention to the condition of the apples we were picking, and the condition of the trees in some cases. After examining them, he said he thought it was the San Jose scale, although he wasn't sure; that they had been studying that at the school, but hadn't had samples while he had been there, so he could not tell exactly how it looked. He took some of the apples and the twigs that were the worst affected back with him to the college, and I soon learned that I had the San Jose scale in bad shape. I realized what I had got for I had read about the insect and knew something of what it would do and the condition in which it would leave the trees if not taken care of—that they would soon die—and I made up my mind that I had got more on my hands than I could handle and about decided to dig those trees out,—the worst of them, at any

rate. My son said so much against this operation, however, that I finally thought I would see if I could save them, but I hadn't much faith in the work.

My father was a man who, like three-quarters or more of our New England farmers, did not believe in pruning his trees. The only thing that he would ever allow the hired man to do, or would allow me to do when I was a young man at home, in regard to pruning trees, was to cut out the dead wood and some of the suckers or water sprouts. So you can see how those trees had been growing for years and in what condition they were. And in addition to that, half or two-thirds of them were badly infested with the scale. When I made up my mind to see what I could do with the trees the first winter, the winter of 1906-7, I started in pruning them what I could. With the condition the trees were in, I only got over a few trees during that winter, with what other work I had to attend to.

There were then about 700 trees on the place. About the first of March I ordered a barrel of Scalecide. I thought I would try to spray the worst of those trees for the San Jose scale. I took a barrel pump and my man and myself went over a few of the worst trees and disposed of that barrel of Scalecide. Then my son stepped in again and said: "Why don't you spray for the codling moth and see if you can raise some good fruit?" Well, I considered that a while and finally I ordered two 100 lb. kegs of Bowker's Pyrox manufactured by the Bowker Insecticide Company of Boston, and my hired man and myself went to work on one of my orchards to spray the trees.

To explain the condition of things, I will have to explain the position of the orchard on that farm. There are two orchards; one at the south end of the farm, which we call the south orchard, contains something over 300 trees; 125 of these are trees that are twenty-one and twenty-two years old, which my father set out. He kept that ground cultivated for two or three years and then it went into grass and has remained so ever since. In the remainder of the orchard the trees are at least sixty and I don't know but more than seventy years old. The north orchard contains a little more than 200 trees and they are all old trees, sixty or more years old. In a part of that orchard the trees are only about twenty-five feet apart and they run up high.

You can imagine what condition they were in. There are also about 200 other trees on the place, scattered over the rest of the farm in rows along by the walls and in single trees through the mowing.

When I commenced spraying for the codling moth my man and I went to work in the south orchard. It took us four days with that pump to go over the orchard. There were a great many high trees in the old part and we tried our best to hit the tops of them. We did fairly well, I think, for a barrel pump and with the nozzle we had that threw streams instead of an even spray. At the end of four days we got over the orchard. The man said: "Are you going over the other one?" I told him no, the work was pressing, and that old pump did work hard. I said if there was any good in spraying we would find it out. Both orchards blossomed apparently alike and my scattering trees the same. I watched the difference between the two orchards through the summer, and I could very soon see that there was a big difference. And when we came to harvest the apples in the fall, from the south orchard I harvested a little over 600 barrels of good, nice, smooth apples which would practically all go for No. 1. There might have been eight or ten per cent that would not. I sold them as mixed apples, as we were in the habit of doing at that time, and got a good price for them. There were only from 30 to 35 bushels of cider apples that came out of that whole lot. In the north orchard I harvested a little over 100 barrels of not nearly as good apples and I sold over five hundred bushels of cider apples out of that orchard. This convinced me that spraying paid, and I made up my mind then to take hold of it in good earnest and do what I could with what trees I had. That fall I decided that if I was going to spray I must get some sort of a power sprayer. I purchased a power sprayer of the Friend Manufacturing Company of Gasport, N. Y., and I decided to use lime and sulphur to spray for the scale. I put in a cooking plant of my own and cooked my own lime and sulphur, putting in a steam boiler and a tank for cooking, and then running the lime-sulphur wash off into my spray tank, and during the month of December, up to about Christmas time, I got over my trees.

It is quite a serious job to spray for San Jose scale and do it in good shape. One who has never done it or handled the



lime and sulphur wash hardly realizes what it is. We are obliged to spray with the wind, and there is always plenty of wind any time during the months that the trees are dormant. Every bit of the wood has to be covered in order to smother the scale. It took me the whole month of December, what weather I could get that was suitable, to spray. In the following March I went all over my trees again and gave them a good, thorough soaking. And of course in May when the trees blossomed I sprayed for the codling moth as before, and two weeks afterwards went over them with another lot of Pyrox. The result was that I harvested 1150 barrels from my orchards and they were all fairly good market apples,—not nearly as many cider apples as I had the year before.

In the spring of 1909 I went through these same operations again, spraying the trees for the San Jose scale, and of course spraying for the codling moth, with the exception that for my McIntosh apples I sprayed before the buds opened; just as they were getting good and pink I gave them a good spraying with Pyrox, and after spraying the first time for the codling moth, in spraying two weeks afterwards I used clear lead arsenate instead of the Pyrox as before, and I think that made quite a difference in regard to the brown-tails on them. A few of my scattering trees I did not spray the second time because they were in fields where the grass was heavy and I did not care to go through the fields, and those trees had the brown-tail moths on them quite thick. But there were scarcely any brown-tails on those trees on which I used the lead arsenate for the second spraying. That arsenate stayed on the leaves and I think destroyed the insects. This last spring of 1910 of course I went through the same process, with fairly good results.

Now in regard to fertilizing my trees. I have taken up two or three different ways in different orchards. My north orchard, in which I spoke of the trees as being close together, the first two years I fertilized with manure from the barn, put on with the manure spreader at the rate of about ten loads to the acre. I ploughed that in, running the plough shallow, not more than three or four inches deep, and kept that harrowed down the greater part of the season. I did that for two years, 1907 and 1908, with that orchard. The south orchard and my scattering trees, I put on for the first two years bone and pot-



ash, mixing them half and half, and putting on about twenty pounds to the tree, not putting it nearer the body of the tree perhaps than three or four feet, and extending out quite a distance beyond the limbs. In 1909 and 1910 I used ashes and bone. In 1909 I put on thirteen tons of Canada hard wood ashes, four tons of bone, and about three-quarters of a ton of nitrate of soda, mixed together and put on with the manure spreader, broadcast over the ground. The north orchard I ploughed again, as I had the two years before. This last year I did not plough it but left it just as it was.

There is a question in my mind in regard to the cultivation of old orchards like these. It has been agitated here that you get better fruit to cultivate the orchards. I think that is true with young orchards, if you follow the cultivation along. But I have had a little experience that seems to indicate that it does not agree with old orchards. These old trees in the north orchard I kept cultivated for three years. I ploughed it each spring and kept it harrowed down, and the fruit of that orchard has been very green. It is possible that I fertilized it too heavily. The foliage has been very heavy, the leaves in a good many cases being half to two-thirds as large as the palm of your hand and just as thick as they could be. The apples set thick and I ought to have thinned them but the trees were high and hard to get at and we were always busy in the spring. I could not get nearly the value per barrel for those apples, and I don't think I got as many apples to the tree as I did in my south orchard. The latter orchard I have not cultivated at all, but kept it in grass, and have done all the fertilizing as a top dressing.

In regard to pruning the trees. After the first year, in which I had got good returns for spraying the south orchard, I hired a man who understood pruning pretty well, and we went to work and did all we could during that winter, up to the time we commenced the spring's work, on pruning. After the first spraying for San Jose scale with the power sprayer, I found my trees were too high. We would use a thirty-foot ladder to pick some of the apples from many of those old trees and then we couldn't reach within five or ten feet of the top. In pruning I cut the tops of those trees out, cutting ten, fifteen, and even twenty feet off the top, and I have also cut the side limbs where you could not get near enough to throw the spray into the cen-

ter of the tree from the tower of the machine. We would throw up from the ground as far as we could. Since then I have been able to get near my trees.

I spoke of fertilizing and putting on thirteen tons of ashes. This last spring I put on eighteen tons and only two tons of bone and left out the nitrate of soda altogether; I think I did better by putting on more of the potash and leaving out the nitrate of soda, and perhaps the bone.

What was the result of these four years' work? The first year I harvested 835 barrels of good market apples; 1908, 1150 barrels; 1909, a little over 1000; and this year there is something over 800, though they have not all gone to market yet. In the year 1907 the 835 barrels returned me a little over \$2400 at my station; in 1908 I received a little over \$2500 at my station; last year the 1000 barrels were all sold in Boston. Part of them were sold in the fall soon after they were packed and the remainder went into cold storage and were sold out in February and some as late as the first of March. I realized something over \$3000 for those. This year I can't tell you what I will realize because they are not nearly all sold, but I have established something of a mail order system and more than 75% of my best apples have gone in that way at a good price, so I am satisfied that even at a smaller price for the poorer fruit which I have left I will realize a great deal more than I have ever done before.

I will say this,—that I should never have gone into this work if my son had not taken an agricultural course at the New Hampshire college. He is very much interested in the farm work and realized from his studies, I suppose, that there was a great future in fruit for New England people; he knew we had those old trees and said so much that I went to work on them. If any of you farmers have sons who want to go to college, influence them to go to the agricultural college and take an agricultural course, if you can. I tried to dissuade my son from this before he went, but it was either go and take the agricultural course in our State College or not go at all, and I think it has been a good thing in that way. The western people are doing all they can to advertise their western fruits in our markets. If our New England farmers would brace up and take care of their old neglected orchards, there is no reason why they should not have the same success that I have; and there is plenty

of room for new orchards, and with the same care and attention that the western people give, there is no reason why they would not do as well. Perhaps we cannot come up to them on size of fruit, but we can surely beat them on the flavor, and we ought to be able to supply our own markets and supply our share of the foreign trade.

PRESIDENT TWITCHELL: I wish Mr. Hardy might give us a little more in regard to his faith in the sod system with his old trees, it being contrary to the generally accepted idea.

MR. HARDY: I will say in regard to the south orchard, I have cut the grass and taken it into the barn. The crop has been very light until this last year. After top dressing with these fertilizers, the bone and potash, using so much last year, the crop of grass was quite a good deal heavier. I did think about leaving it on the ground as a mulch, and then I was afraid of fire running over it and spoiling the trees, and I put it in like any other hay. Now last year my prize apples on which I took the cup at the New England fruit show, came from the young trees in the south orchard. They are not so large as they ought to be for their age from the fact that they have never been cultivated. They were bearing anywhere from four to six or seven barrels to the tree, and I was obliged to put twenty or thirty props under some of the trees and then they would break down in spite of me. It is a question in my mind. I have some idea of ploughing a part of that orchard but I am almost afraid to do it from the fact that I am afraid it will result as it did in the old orchard and that I won't get the color.

PRESIDENT TWITCHELL: Prof. Gardner of Orono was appointed to open the discussion on the subject of insect pests. He has kindly consented to follow Mr. Hardy at this time.

PROFESSOR V. R. GARDNER:

*Mr. President, Ladies and Gentlemen:*

After two days, or two days and a half of such a program as we have had, with the lectures and with all the questions that have been asked and the answers given, there is hardly anything left to say for the last man that is scheduled to come on the program, so that I shall probably have to be excused with a very few remarks.

If there has been one thing that has been emphasized in this meeting thus far more than anything else, it has been the necessity of spraying thoroughly to control our insect pests, and if there is one thing that needs emphasis more than anything else it is that very thing. For I doubt if there is one factor that is more important than that in building up a better and more promising and more successful fruit industry in the State. There are a number of factors which enter into the development of an important and a successful and a modern fruit industry. Good pruning is one. Good fertilization is another. The proper selection of nursery stock is another. All of these have been mentioned, but as I say, the emphasis at this meeting has been put upon spraying, and rightly so, because that probably is the most important of any single factor.

There is one side of the insect and disease control problem, however, to which comparatively little attention has been called, and it may well be mentioned for a moment at this time, and that is the matter of good orchard sanitation. We can control most of our orchard insects and most of our orchard diseases by means of the spray pump and arsenate of lead and lime and sulphur, with other materials that go along with them, but there are certain pests which the spray pump is not able to reach. We have got to handle these pests in another way. I refer especially to the railroad worm, the trypet, the apple maggot, as it is variously called, and to another pest which though perhaps not quite as serious is still doing a great deal of damage in most of our apple orchards, viz., the curculio. Those are two serious apple insects in this State. I don't remember of having been in an orchard where I have carefully looked at the fruit but that I have seen more or less of the work of both of these pests. I have been in some orchards in the State where perhaps 50% to 75% of the apples on a single tree would be injured by the curculio, and I have been in other orchards where 100% of the apples upon the tree, and probably 98% of the apples in the whole orchard were not only injured but ruined by the apple maggot. Now what are we going to do to control these pests? Are we going to be able to meet them? To meet these pests at the present time is not exactly an easy proposition, but it is within our reach, and the remedy, as I suggested a moment ago, is that of clean culture or good orchard sanitation. By clean



culture I do not necessarily mean ploughing the orchard every spring and using the harrow and keeping the ground clean and free from growth of any kind until the fall and letting the orchard go into winter in bare soil. But certainly for the first part of the season the orchard should be ploughed and harrowed a few times,—at least those orchards should where these pests are doing very much damage.

A few weeks ago, about the middle of September, a number of orchard growers wanted me to look at some of their trees, and tell them what was the matter with the fruit. We found that practically all the trouble was the trouble that was illustrated by this Northern Spy apple that you just had before you. As Prof. Bonns has said, those apples have all the appearance of being infested with the railroad worms. It is possible, however, that it may be another species of a closely related insect that is troubling them. But whether it is the apple maggot, or the curculio, or another closely related pest, the remedy is precisely the same. It is clean orchard culture. Most fortunately indeed in this trip a few weeks ago that I mentioned, absolutely clean culture had been practiced in the orchard that I went into, this season and also the season before—an orchard almost within your own city limits. And that orchard, surrounded by other orchards of the same varieties that were badly infested with this trouble, was almost practically free from it. Perhaps five per cent, perhaps in the case of trees near the other orchards ten or even fifteen per cent of the apples upon those trees were infested with this trouble, but there is a great difference between 90% or 95% sound fruit and 90% or 95% blemished fruit. So whatever that particular species may eventually be found to be, that is causing this trouble in our Northern Spies and some of our other varieties, that remedy seems to be the one which will do the work.

There is another thing in connection with orchard sanitation that should be mentioned. A great many of our orchards are not set in block form. The trees are scattered along stone walls or along fences in such a position that they are not only difficult to spray but it is almost impossible to cultivate close to them. Perhaps we cannot get within four or five feet on either side. Under such circumstances, if the railroad worm or the apple curculio gets into our fruit we have a very difficult task to get



rid of it. Perhaps if we can turn hogs or sheep into the orchard or the fields where these trees border we may be able to control the trouble partially; but it will only be a partial control. I think there are many places in the State where trees are growing along fences and along stone walls, that year in and year out are producing perhaps half a peck to a peck of sound fruit and a bushel to five bushels of blemished fruit, that it would be a great deal better for the fruit grower to cut down and burn these than to leave them to be a menace to his orchard and to his neighbors' orchards. If these particular pests, viz., the railroad worm and the apple maggot and the apple curculio, and perhaps others that work in a similar manner are not troubling the trees along such places we can fight off the other pests by means of the spray pump, driving right along each side in most cases, and control the caterpillars, the codling moth, the scab and probably the canker; but in those places where we cannot reach the tree satisfactorily with the spray pump, or where the trees are affected by pests that cannot be reached by means of a spray, I think good sanitation, protection for the rest of our trees demands that we dispose of them and start trees in another place. It is a profitable thing to have trees along the fences if we can grow sound fruit there; but if we cannot grow sound fruit there, if the trees are a menace to the rest of our orchard, it is not a paying business proposition to have them. These two pests we have just been mentioning, the curculio and the railroad worm, spend the winter near the surface of the soil, in beds of sod, or under sticks, or under stones, and then come out early the next spring to infest another year's crop. And unless we can turn the soil over and bury these pests so deeply that they can't come out the chances are we shall have them the following season and instead of decreasing in numbers they will increase.

Another point that may be mentioned in connection with orchard sanitation and which bears directly upon the control of our insects and diseases is great care in the pruning of our trees, in the removal of all dead or dying limbs. Sometimes we see a limb towards the outside or the top of a tree that has died back six inches. It is only a small limb but something has destroyed it. We think it is too far out or too much bother to remove it. If that limb is left there, probably by the end of

another season it will infest several other limbs, or will have died back much further. It is canker in the majority of cases that is killing back the limbs of our trees, and in pruning we cannot be too careful to remove the ends of all these dying limbs. Cut them well back into the living tissue and get rid of that source of the disease to the other healthy portions of the tree and to the other healthy trees in the orchard. In the same connection it should be said that where we prune small branches infested in that way, great care should be taken to carefully rake up and burn all the prunings, for if these things are left to lie upon the land, with insects and birds lighting upon them and then flying back to the trees, they become nearly as bad a source of infection for other live healthy wood on the ground as they would be if they were left upon the tree. Of course in the case of an orchard which is cultivated, the smallest twigs would probably be ploughed under and the source of infection destroyed in that way. But we cannot be too careful about sanitation in our orchards. Good sanitation is something which goes right along with good spraying, and good spraying cannot have its highest efficiency unless good sanitation accompanies it. It seems to me, in connection with the control of our orchard pests and our orchard insects, that is the one thing that should be emphasized in addition to what already has been emphasized in the various sessions of the meeting.

PRESIDENT TWITCHELL: We are now coming to the closing moments of this session. I want to thank those present for their promptness in attendance and for the excellent order which has been maintained throughout, and for the freedom with which we have participated in the discussion. It seems to me that this may be a fruitful time which we have spent together.

PROF. E. F. HITCHINGS: I have been asked to say a few words in relation to Maine's position in the New England Fruit Show. At our annual meeting held three weeks ago in New Hampshire, we voted to hold the next annual exhibit in Boston next fall, during the last week in October or the first week in November. The date has not been set but it will be later than last year for the benefit of the states who worked at a disadvantage last year. The meeting was held so early that most of the leading varieties of Maine apples had not colored as they should, and were not in a condition to exhibit. The exhibit last year

was the first ever attempted in New England, and but few of our orchard men had ever attempted to pack apples in boxes. We have here today 110 boxes, most of them packed by our own orchardists. I think we are seeing results from this movement for better fruit. The future of the New England fruit question, so far as Maine is concerned, I believe rests with you who are interested in orcharding, you who will go to Boston with your fruit next October or November. Possibly we shall not have any more fruit than we had at the first exhibition; there may not be room for it, as other states will send their carload lots, but it is the quality which will tell. We have much to learn in relation to the packing of the fancy box if we are to secure the same rights and privileges and conditions that the people who send us apples from Oregon have; and the same with the barrels. There are certain requirements for a first-class barrel pack and also for a first-class box pack. We must come up to these requirements. I hope you are all interested to the extent that you want to see better fruit in Maine. Let us raise the best quality of fruit, and then see that we come up to the requirements for first-class packing, and Maine will have a name throughout the length of the land for her fruit, as she does for her grain and potatoes, especially the Aroostook potato.

I hope that every member of this association will make up his mind to go to Boston next year and show them that Maine is still in the fight for better fruit. Lots of blue ribbons came to Maine last year, and we are proud of it. It is not so much the value of the premium as the name, and the honor of knowing that we can raise fruit.

I want to say that in two years from now the New England Fruit Show will be associated with our Pomological Society in its meeting, and of course that meeting will have to be in a location that will be accessible to New England. The project is that it shall be a biennial exhibit, and the alternate year the members shall meet with and take an interest in the Pomological Meeting in one of the other states. This year we met with New Hampshire, and I was very much surprised not to find a single box, barrel or plate of apples from Maine at that exhibit. I think this was a mistake. Two years from now, wherever that meeting is held, let us go there with an exhibit to compete

with New England. And in the next year, before we go to Boston, let us learn to pack our apples, and I assure you that if Maine goes there with the right kind of package she will win her share of blue ribbons.

A pleasing banquet closed the week's sessions and proved the interest of the city in the work of this society.





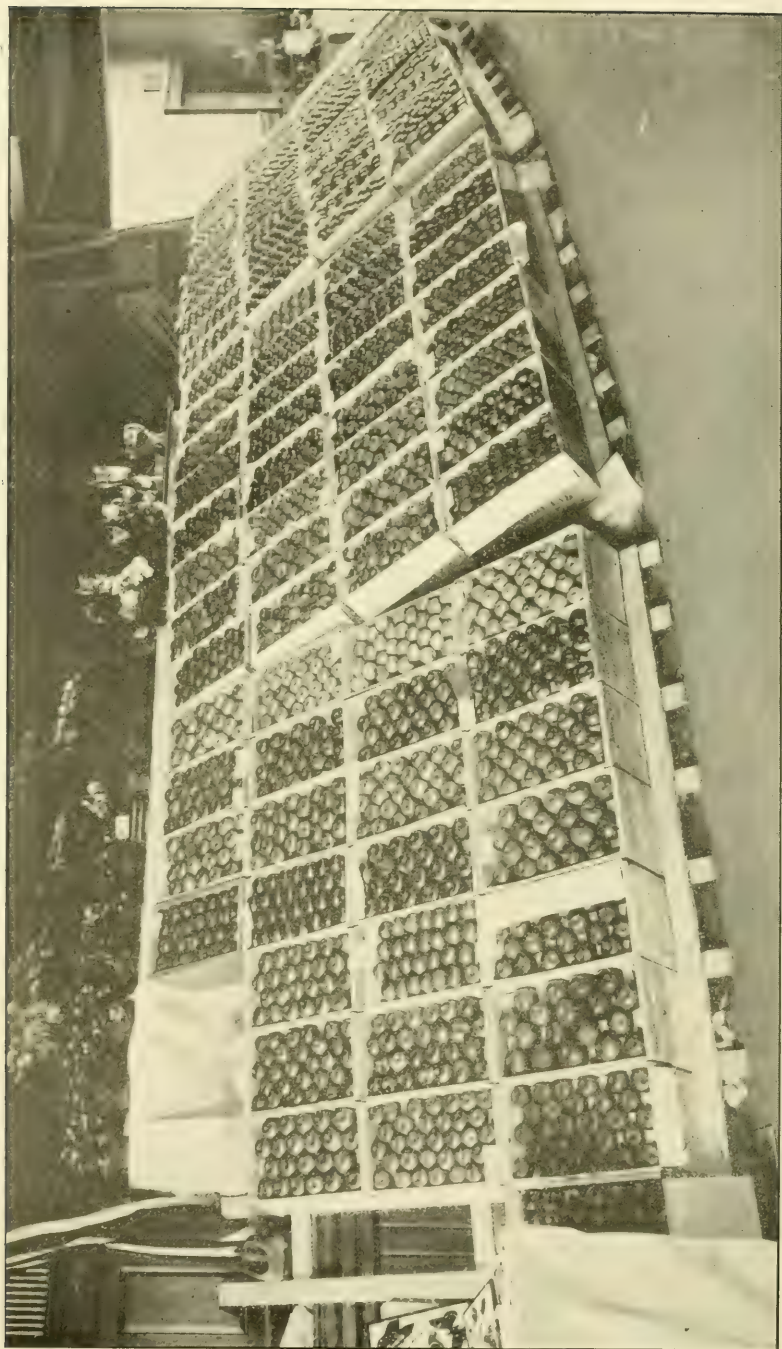
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Portion of Box Exhibit at Annual Meeting State Pomological Society, Augusta, November 14-16, 1911.

TRANSACTIONS  
OF THE  
Maine State Pomological Society  
FOR THE YEAR 1911



ANNUAL EXHIBITION HELD IN AUGUSTA NOVEMBER 14, 15 and 16, 1911.

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WATERVILLE  
SENTINEL PUBLISHING COMPANY  
1912



## OFFICERS FOR 1911.

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### *President.*

DR. G. M. TWITCHELL, Auburn.

### *Vice Presidents.*

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G. L. PALMER, South Livermore.

### *Secretary.*

E. L. WHITE, Bowdoinham.

### *Treasurer.*

E. L. LINCOLN, Wayne.

### *Executive Committee.*

WILL E. LELAND, Sangerville.

F. H. MORSE, Waterford.

E. F. HITCHINGS, Orono.

### *Member of Experiment Station Council.*

R. L. CUMMINGS, West Paris.

### *Trustees.*

Androscoggin County—Silas A. Shaw, Auburn.

Aroostook County—Edward Tarr, Mapleton.

Cumberland County—John W. True, New Gloucester.

Franklin County—E. F. Hardy, Farmington, R. F. D.

Hancock County—William H. Miller, Bar Harbor.

Kennebec County—E. A. Lapham, Pittston.

Knox County—Alonzo Butler, Union.

Lincoln County—H. J. A. Simmons, Waldoboro.

Oxford County—W. H. Allen, Buckfield.

Penobscot County—A. A. Eastman, Dexter.

Piscataquis County—C. C. Dunham, Foxcroft.

Sagadahoc County—J. H. King, Bowdoinham.

Somerset County—Frank E. Nowell, Fairfield.

Waldo County—Vacant.

York County—J. Merrill Lord, Kezar Falls.

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## MEMBERS OF THE SOCIETY.

### LIFE MEMBERS

Allen, Wm. H. ....	Buckfield	Gulley, Alfred G. ....	Storrs, Conn.
Andrews, A. Emery .....	Gardiner	Hackett, E. C. ....	West Gloucester
Andrews, Charles E. ....	Auburn	Hall, Mrs. H. A. ....	Brewer
Atherton, Wm. P. ....	Hallowell	Hanscom, John .....	Saco
Atkins, Charles G. ....	Bucksport	Hardy, E. E. ....	Farmington
Averill, David C. ....	Temple	Harris, William M. ....	Auburn
Bailey, W. G. ....	Freeport	Heald, U. H. ....	Paris
Bennoch, John E. ....	Orono	Herrick, A. A. ....	Norway
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Bisbee, Stanley .....	Rumford Falls	Jackson, F. A. ....	Winthrop
Blanchard, Mrs. E. M. ....	Lewiston	Keene, Charles S. ....	Turner
Blossom, O. E. ....	Turner Center	Keyser, Howard L. ....	Greene
Boardman, Samuel L. ....	Bangor	Knowlton, D. H. ....	Farmington
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Burleigh, Miss Clara M. ....	Vassalboro	Leland, Will E. ....	East Sangerville
Burr, John .....	Freeport	Lincoln, E. L. ....	Wayne
Butler, Alonzo .....	Union	Litchfield, J. H. ....	Auburn
Butnam, J. W. ....	Readfield	Litchfield, Mrs. L. K. ....	Lewiston
Chadbourne, C. L. ....	North Bridgton	Littlefield, Harry W. ....	Brooks
Chandler, Mrs. Lucy A. ....	Freeport	Lombard, Thurston M. ....	Auburn
Chase, Henry M., 103 Federal St.	Portland	Lord, J. Merrill. ....	Kezar Falls
Chase, Homer N. ....	Auburn	Luce, Willis A. ....	Columbia Falls
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Conant, W. H. ....	Buckfield	Mayo, E. P. ....	Waterville
Conant, W. G. ....	Hebron	McAllister, Zaccheus .....	West Lovell
Corbett, Herman. ....	Farmington	McCabe, George L. ....	North Bangor
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Crowell, Mrs. Ella H. ....	Skowhegan	McManus, John .....	Brunswick
Crowell, John H. ....	Farmington	Merrill, Oliver F. ....	Gardiner
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Gilbert, Z. A. ....	North Greene	Pulsifer, D. W. ....	Poland
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Grover, Franklin D. ....	Bean	Richards, John T. ....	Gardiner

# STATE POMOLOGICAL SOCIETY.

## LIFE MEMBERS—Concluded.

Ricker, A. S. ....	Turner	Thurston, Edwin. ....	West Farmington
Ricker, Fred P. ....	Turner	Tilton, William S. ....	Boston, Mass.
Roak, George M. ....	Auburn	Townsend, Mrs. B. T. ....	Freeport
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Sawyer, Andrew S. ....	Cape Elizabeth	True, John W. ....	New Gloucester
Saunders, Ernest. ....	Lewiston	Twitchell, Geo. M. ....	Auburn
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Simmons, H. J. A. ....	Waldoboro	Vickery, John. ....	Auburn
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Smith, Henry S. ....	Monmouth	Walker, Elmer V. ....	Oxford
Snow, Mary S. ....	Bangor	Waterman, Willard H. ....	East Auburn
Stanley, H. O. ....	Winthrop	Waugh, F. A. ....	Amherst, Mass.
Staples, Geo. W., 904 Main St., Hartford, Conn.		Weston, Joseph. ....	Gardiner
Starrett, L. F. ....	Warren	Wheeler, Charles E. ....	Chesterville
Stetson, Henry. ....	Auburn	White, Charles M. ....	Bowdoinham
Stilphen, Asbury C. ....	Gardiner	White, Mrs. Annie. ....	Bowdoinham
Supt. Maine Sanatorium Farm. ....	Hebron	White, Edward L. ....	Bowdoinham
Taylor, Miss L. L. (Lakeside) ....	Belgrade	Woods, Chas. D. ....	Orono
Thomas, William W. ....	Portland	Wright, Frederick. ....	Bath
Thomas, D. S. ....	North Auburn	Yeaton, Samuel F. ....	West Farmington

## ANNUAL MEMBERS FOR 1911.

Bass, Lizzie E. ....	Wilton	Jones, Geo. T. ....	Fairfield Center
Bass, Mary A. ....	Wilton	Jones, L. R. ....	Wayne
Bicknell, C. S. ....	So. Weymouth, Mass.	Jones, O. K. ....	Sabattus
Bonnas, Prof. W. W. ....	Monmouth	Knowlton, Geo. H. ....	Vassalboro
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Brock, Dr. H. A. ....	Portland	Lee, Lyman K. ....	Foxcroft
Bryant, J. B. ....	Buckfield	Littlefield, J. R. ....	Brooks
Burleigh, Mrs. H. C. ....	Vassalboro	Macomber, E. W. ....	Winthrop
Carll, E. C. ....	Augusta	Millsbaugh, Mrs. L. H. ....	Winthrop
Conant, A. A. ....	Hebron	Nichols, Dr. Estes. ....	Hebron
Conant, Elsie A. ....	Hebron	Patten, R. G. ....	Skowhegan
Conant, E. E. ....	Buckfield	Pierce, Franklin. ....	Hebron
Conant, H. L. ....	Hebron	Perley, C. A. ....	Winthrop
DeCoster, Mrs. V. P. ....	Buckfield	Prescott, F. ....	Carmel
Dolloff, E. W. ....	Standish	Reed, R. C. ....	Temple
Eastman, E. A. ....	Dexter	Rines, J. Henry. ....	Portland
Flint, John M. ....	E. Baldwin	Rogers, Frederick P. ....	Carmel
Freeman, Geo. H. ....	Wayne	Rogers, Mrs. Jeanette S. ....	No. Newburgh
Gardner, A. K. ....	Augusta	Smith, Geo. S. ....	Monmouth
Gardner, W. M. ....	Brewer	Sparrow, Geo. E. ....	Gardiner
Harris, M. H. ....	Greene	Sturtevant, Ernest F. ....	Auburn
Harvey, Geo. L. ....	No. Anson	Tarr, Edith A. ....	Mapleton
Hayes, William. ....	Gardiner	Tucker, Benj. ....	Norway
Heath, Gardner K. ....	Readfield	Washburn, C. C. ....	Mechanic Falls
Jewett, P. E. ....	Alna	Winslow, E. B. ....	Portland
Johannsen, O. A. Experiment Sta., Orono		Yeaton, Geo. A. ....	Augusta



ANNUAL MEETING  
OF  
MAINE STATE POMOLOGICAL SOCIETY,

AUGUSTA, MAINE, NOV. 14, 15 AND 16, 1911.

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TUESDAY EVENING, NOVEMBER 14.

Music.

Prayer by Rev. L. W. Coons, of Augusta.

Music.

In the absence of the Mayor, Hon. Niles L. Perkins gave the address of welcome on behalf of the city.

*Members of the Maine State Pomological Society, ladies and gentlemen:*

I deem it a great honor and special privilege tonight to be granted the opportunity to welcome, in behalf of the Mayor, the Maine State Pomological Society to this capital city. Knowing what you stand for and realizing what you have accomplished, I wish to extend to you a hearty greeting and cordial welcome on the part of every citizen within our borders. It has always been the custom of Augusta to throw open its gates and give enthusiastic support and co-operation to every and any society or body that comes into our midst with the object of advancing and developing the resources of Maine. You have gathered here tonight, as I understand it, for that very purpose,—to discuss different experiments which you have tried since your last meeting, to initiate new ones, and thereby develop and make more productive the fruit growing industry, which is one of incalculable value and far reaching importance to the welfare and prosperity of our State.

Any one who knows anything about the teaching of this industry fully understands the obstacles which it has had to surmount. I have been in the forestry business three years in this city; I have done work in and traveled over the greater por-

tion of southern Maine; I have spent hours and days trying to get people to spray their trees, to do pruning and take better care of their orchards, and I fully realize how hard it is to get people to do anything along this line. Although this Society has been working in the State for a great many years and putting in hard work, nevertheless you can go into many parts of Maine today and see old orchards which, if the trees were properly sprayed, the dead limbs pruned, the cavities cared for, and the ground fertilized, could be made to yield many times more in quantity and fruit of much better quality. In the West, especially along the Pacific coast, where I was a few years ago, I found that they took the very best care of their fruit trees. They kept them under the highest cultivation and as a consequence made them yield the maximum in quality and quantity. There is only one thing for us to do, and that is what this Society is doing,—to go out amongst the people, make our beautiful displays of fruit, as you see here this evening, that are obtained under scientific treatment, build up a permanent school of instruction, and bring home to the individual by actual practical tests the fact that they must do these things in order to accomplish the best results. We cannot stand still. We must either progress or go backwards.

You could have selected no better city than Augusta in which to hold this meeting. She, today, is the convention city of the State. There is every reason why she should lead the other cities in this respect. She is centrally located. She has ample accommodations to provide for the welfare and comfort of all comers. When a few years ago she found that her accommodations were inadequate for all who wished to come, the citizens put their shoulders to the wheel, got down into their pockets and the present Augusta House is the result. There wasn't a citizen who ventured in that movement who expected to get the full return on his money. It was purely and simply a public spirited movement. Recently the Maine Teachers' Association met here, numbering some 2,700. I think it was one of the greatest conventions that was ever held among the teachers. They were highly pleased with the reception and care they received while in the city and agreed to come and see us again. And that is the way we are going to make you feel before you go away. Our homes are all open to you, to stay as long as you will.

There is one thing that you can always count on the Augusta citizens to do, and that is to lend personal aid and assistance to anything which has for its object the welfare and prosperity of this grand old State. Too often we come to these meetings, listen to what is said, and then go away without putting any further thought upon it. But tonight let us make a resolve that we will in the future boost this industry and carry what we learn into every nook and corner of Maine. There is one thing that we have got to do in this State, both young and old, and that is to boost Maine. You cannot boost Maine too much. She has the soil, she has the climate, she has the men and she has the brains. The Southerners are continually boosting the South. The people of the West will make you think that if you invest a little money there you can grow almost anything on the desert. I am a great believer in advertising our State.

In closing, I wish to state again that Augusta gives you a cordial welcome and that it is the earnest hope of every citizen that your stay here may be so pleasant and instructive that you will be glad to come and see us again.

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#### ADDRESS OF WELCOME.

By HON. E. C. CARLL, President Board of Trade.

I am glad that I have the opportunity to express the pleasure of the Augusta Board of Trade in having this organization here. And I cannot help feeling that the pleasure is mutual. I believe you are glad to come because you share in a general feeling that exists throughout the State of Maine that Augusta is a good place to come to,—a general liking of the city of Augusta which is doing much to make it the great convention city of the State of Maine.

The interests of agriculture, commerce and the industries are mutual. Farm prosperity makes an ever increasing contribution to commerce. Not only do the city men realize more fully than ever how much of their prosperity is based on a prosperous agriculture, but there has developed a widespread ambition among them to do some of the farming themselves. Farming is becoming the style. As an old Granger, I found the recent

meeting of the State Board of Trade much like a Pomona Grange meeting. The president reminded them, even the second time, that they were supposed to pay some attention to the subject of new industries, but they kept right on talking about fertilizers and crops just like any other set of farmers. And when interested, these keen business men are no mean students of the problems of agriculture. The recent great Corn and Fruit Show in the city of Portland showed not only an interest in the subject in the general promotion of business, but an intense interest among business men in the occupation itself, in making up the large list of special prizes contributed practically by members of our Board of Trade. We found in working for these prizes so many men who seemed to have a great interest in farming that getting the prizes was one of the easiest things you ever saw.

You have met to promote a great branch of agriculture. Your exhibition will stimulate interest and your program, with addresses by specialists, will lead to better and more profitable methods. I hope you will also induce those who know how to do things to branch out and extend their operations in order to break away from the 7 x 9 efforts. All branches of farming should have the Aroostook spirit, throughout the State. When the Aroostook man got the right method he gave up the idea of a potato patch and planted a field. Years ago a prominent man in one of Maine's cotton mills when a new building was finished, said: "This corporation has laid its last brick. We have room enough." But that corporation has been laying bricks ever since and is still at it. Expansion is as necessary to the growth of business as to the growth of trees. I wish that the broad gauge view of extensive operations by right methods might spread all over Maine, whether in orcharding or whatever crops may be grown to the best advantage.

When I was a boy I remember seeing some men tear down an old house, to erect another on the spot. The house was old, weather-beaten and delapidated. It seemed to me as though its building must have been way back in the early settlement of the town. But an old man took me to a near-by pasture on the same farm and pointed out a grass-grown hollow surrounded by apple trees, and said that was where the pioneer's dwelling stood, and that the house I then saw demolished was the second that had been worn out on that farm. Last year I visited that

spot and there I saw one apple tree loaded with beautiful fruit, one of the many instances illustrating the old age and hardness of that fruit of our Maine soil. I tried to picture in my mind the planting of that tree by the pioneer; his interest, before the days of grafting and budding, in the first fruits of the tree, and his pleasure in finding it of pleasant flavor and a good keeper. I imagined the children of that old time home bringing those apples up from the cellar and eating them before the broad hearthstone, while their great fires up the chimney roared. And still the old tree flourished while their children and their children's children lived and passed away; and no man in that town today can tell the name of those settlers or point to you their last resting place, while that tree stands, hardy, vigorous, productive, typical of the stock that settled these Maine farms, its May time bloom and the blushing fruit illustrating the girls of Maine as they then were and as they now are. There is no fruit like the apple. Let us thank the Giver of all good and perfect gifts that it finds its most congenial environment upon these grand old hills of the State of Maine.

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## RESPONSE.

By PRESIDENT G. M. TWITCHELL.

In behalf of the Maine State Pomological Society I wish to express our obligations to you for the cordial invitation and the hearty assistance rendered in perfecting the plans for this gathering. It is a double pleasure to me, standing in this position, for I am coming back home where I have spent twenty years in work upon these streets and among some of you who are now residents and active in the work here. To come back here among the old associates and greet them and be greeted, as I have been in the past few days, is, I assure you, a pleasure which will be remembered long after I have returned to my present home. It is a pleasure to me to stand here to express our obligations because I appreciate what Augusta has been doing in the years for itself in the improvements which have come upon your streets and business places, in the enterprise which has been manifested all along your lines, knowing that what tends to the improvement of any town or city in the State



tends to the benefit of the State as a whole. So what we have been doing in our little work, or in our greater work upon the hills and down the valleys of Maine, has been tending to the good of the State of Maine as well.

It was not necessary that you should express your appreciation of our coming, it was not necessary that you should speak the word of welcome,—you gave utterance to it in a very forcible manner in the magnificent list of special prizes which you offered to be distributed here among the fruit growers of the State, showing your desire to help in a substantial manner, in strengthening the desire for the growing of better fruit, for the more thorough cultivation of our orchards, for the building up of an industry which in the years may become of transcendent importance to this good old State of Maine. We are all linked together. Whether we work upon the paved street, or out upon the gravelly hills,—wherever we toil we are all working for one end and for one purpose, the building of a better standard of manhood and womanhood and the carrying forward of the industrial progress of the good old State of Maine.

So, speaking for the State, for its orchard industry, let me direct your attention for a moment to one or two little facts. Maine has been peculiarly blessed this year. Of all the states of the Union Maine ranks highest in the percentage of farm crops. This is something we want to remember, friends, because it speaks not only of a blessing which has been bestowed upon us, but it speaks also of the industry and thrift and energy and skill and patient toil of the men and women upon the farms and in the towns of the State. If I had time I would like to speak of our varied industries, and I want just for a moment to speak of this industry and its value, because I know that the business men of the State have little knowledge, real knowledge, of what it is and of what it is doing. We have not come here, my friends, in answer to your invitation, that we might exhibit the fruit alone, we have not come here that we might listen to or participate in the discussions of the varied questions,—we have come that we might call, if possible, the men and women of the cities and the towns, who are not the producers of food, into our gatherings, and that they might see something of what the men are doing out upon the farms, that they might come to realize that the struggle there is for improvement, that the effort there is for the building up of a better standard of quality

of all the products of the farm; that you might come to feel, ladies and gentlemen of the city and town,—how dependent you are upon the man upon the hills, how necessary he is to your existence, and how there should be a closer bond of fellowship between all classes in the years to come for the building up of the State. This industry which we are seeking to promote means much to the man of the town as well as to the man of the farm, an industry which in the State of Maine this year will equal fully one and one-half million barrels of apples, yet we have not reached a full crop. It is only in sections of our State that our crop approaches its full capacity. So that we are capable easily of growing more than two million barrels of good fruit, such fruit as you see here upon these tables.

I have in mind a little orchard of five acres set in 1888,—200 trees, of which there are now living about 135 to 140 trees, some good, some bad and some indifferent, and yet the owner of this orchard for the past nine years has taken out of it an average of 268 barrels of apples which have sold upon an average for better than \$3 per barrel. This year the crop was 550 barrels, following a crop of 287 last year. You see as an investment, as a business proposition, it appeals to you. The most marked results attained in New England are reported by a gentleman in Massachusetts, who set an orchard of 5000 trees in 1904 and 1905 and this year has taken from those trees \$10,000 worth of fruit. It seems almost beyond comprehension that these things can be, and yet they all attest what the men on the farm are seeking to do, and it seems to me must suggest to you the fact that they are working upon great problems as well as you in the towns and cities, and working, as I said before, for the good of the State of Maine.

This Society stands pledged first of all to the promotion of fruit growing, and the strengthening of the desire for the growing of better fruit, and the study of the questions of soil conditions; that we may select varieties which are best adapted to individual sections and localities, and the perfecting of fruit which shall do the most for the State. I believe it offers an inducement to men seeking an investment which cannot be duplicated anywhere else in this country. If the men of Maine, who have been sending their money to the far West, had but invested it upon the hills of Maine, during past years, their returns would have been far more secure and far more substan-

tial. If the banks of the State of Maine, instead of lending so large a percentage of their money upon western securities would lend more in the good old State of Maine, we should hear the hum of industry everywhere. So as we labor, let us remember that we are working together and that these things which we notice today and which call for correction are to be corrected only as men in the town and men in the country stand shoulder to shoulder to help solve the great problems which come into their hands, and doing that we will find that the Maine State Pomological Society, uniting with the boards of trade in towns and cities, will hold yearly larger and still larger exhibitions, will call together yearly larger and still larger numbers, will exert a wider and still wider influence, and in the years we will find that this fruit industry is becoming one of the great industrial works of the State and bringing satisfaction as well as comfort and substantial returns to every locality.

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### SOME LESSONS FROM 1911.

By GEORGE T. POWELL, President of the Agricultural Experts Association, New York.

Each year as it passes has its particular lessons which if they are learned should be a help in the coming years.

One of the chief obstacles to the more rapid progress of a large number of those engaged in farming is that of not studying the conditions of each year as they present themselves, and changing and modifying their practice to more efficiently meet the requirements of existing conditions.

### DRY WINTER OF 1910-11.

The year just passing was preceded by an unusually dry winter. Very little rain fell in the autumn of 1910, and but little snow covered the ground in many sections through the winter, while there was a deficiency of rainfall through the spring and summer. There was an unusual loss of trees and shrubs in many places in New England and New York, the cause for which was attributed to the severe open winter.

## EVERGREEN TREES INJURED.

Evergreens suffered most, and many of them came out in the spring with their foliage seared and brown and dead. It was generally accepted that the steady cold weather of the winter and the long period of freezing temperature had killed the evergreen trees and shrubs. Evaporation in the winter has been the cause of this. The fact is, it was not so much the freezing as the evaporation of the sap of the trees in the winter. Trees must have an abundant supply of moisture in the soil in the winter, for the process of evaporation of sap goes on in the winter the same as in the summer, though not to so great a degree.

When trees are in full foliage in June, with a steadily rising temperature, tons of water are daily taken up by them individually, and passed off into the atmosphere by evaporation and transpiration through the foliage.

In the winter when the foliage is absent the process of evaporation goes on steadily, and more rapidly when the temperature lowers and wind prevails.

It is at such times that the peach buds suffer and are often killed. The moisture is evaporated so rapidly that they are left for a time in a dry condition and it is then that the germ is killed. It is the dry condition that is produced, not the low temperature that kills the bud.

It is quite generally conceded that a temperature of sixteen to eighteen degrees below zero will kill peach buds, but such is not a fact.

## PEACHES WITH LOW TEMPERATURE.

One of the largest and most valuable peach crops I have ever produced at "Orchard Farm" was that following a winter when twenty-six degrees below zero was recorded. Very few buds were killed and we had to thin off seventy per cent of the fruit to save the trees from breaking. We have never spent an hour of time propping trees, but rather we prune and thin heavily. These trees had produced a heavy crop the preceding year, which was one of normal rainfall. They made good growth of wood; the fruit buds were strong and well developed; the soil was well filled with water before winter, and

while there was not snow during the winter and low temperature prevailed frequently, the trees came out in the spring in good condition, the buds strong and able to give a full bloom, and set a large crop of fruit.

#### TILLAGE AND CROPS.

In most sections where peach orchards were given good summer culture in 1910, and the cultivation was kept up late, there were excellent and full crops of fruit the past season, but where cultivation of the soil was neglected the crop was a failure.

The season of 1911 will long be remembered for its unusual deficiency of rainfall. Many farmers had to draw water long distances for their stock during the winter months, while the hay crop was heavily reduced by the prolonged drought of the spring and summer.

One of the most valuable lessons that farmers and fruit growers should have learned from the year 1911 is that of the importance of the tillage of the soil.

At "Orchard Farm" with the exception of a few local showers that moistened the surface of the soil a few times, during seven months there was not sufficient rainfall to affect springs or streams; yet, we have never produced a larger crop of apples, or of better quality, and particularly of better size.

This sample of Rome Beauty apple (exhibited) was taken from a tree that produced one and one-half barrels of apples the seventh year from planting, the tree being a medium size of two years when planted. There were many McIntosh trees that produced the same quantity at the same age.

This orchard with others was given early and continued cultivation up to the middle of July. The indications seemed to be those of a continued dry period, and cultivation was then to be relied upon to conserve such moisture as was in the soil to keep up the growth of the trees and the maturing of a fall crop of fruit.

#### CLOVER AND BUCKWHEAT COVER CROPS.

For nearly twenty years it has been our practice to sow clover for a cover and green crop to be plowed in annually, but for two years the summers have been so dry at the time of



seeding, in July, that a light growth only of the clover has been obtained. The past season, to make more certain a larger humus crop, we sowed buckwheat over nearly one hundred acres of orchards. Much of it reached five to five and a half feet high, some of which was plowed in, in September, before the seed formed, but as large crops of fruit had to be handled, the balance was cut and left on the ground. This large growth together with the mass of roots in their decomposition will add much humus to the soil.

#### A NEW LESSON SUGGESTED.

We have long been an advocate of clean cultivation, allowing no sod about the trees. We also advocate low headed trees for the first six years of a young orchard. We are still in favor of that culture.

We are now going to adopt a different method after seven years of cultivation, which will be not to plow or cultivate nearer than seven feet from the trees, or such distance as will avoid crowding against the trees by the teams.

#### HIGHER COLOR DESIRED.

With continued cultivation and with the leguminous crops plowed in for several years, while good size in the fruit is obtained, it requires a longer time in which to have the high color so desirable brought out.

It is known that on the trees that stand in sod the apples are more highly colored, though they are smaller in size and yield.

Without doubt the grass takes up moisture and checks the development sooner, which brings out the color better and earlier.

If in the highly cultivated orchards the apples are left on the trees until all get good color, there will be a large loss from the dropping of the fruit and from storms that are liable to reduce the crop. The suggestion is sometimes made that the earlier maturing apples be picked, going over the trees two or three times. This is impracticable on any large scale. Very few men can be employed who will select the mature fruits. They will pick as many of the uncolored as colored apples, while they will knock off many more in moving and placing

ladders. This is practical only with dwarf trees, where it might be done to advantage.

#### THE ROOTS OF A TREE.

As trees grow older the roots next to their trunks perform a different function than while they are younger. They become the strong bracing parts of the tree, to hold it in place and to resist the winds, when the trees begin to take on heavy weight in the fruit they carry. Were it not for the strong large roots the trees would blow over during high winds, and especially when the soil is wet from heavy rains. There are very few fine or feeding roots on these enlarged portions for a few feet out from the trunks, the trees getting their main nourishment from the fine fibrous roots out at the extremities that push out and into the soil in all directions.

We are inclined to believe it will give better results to have the soil undisturbed next to the trunks of the trees; to keep such vegetation, mostly weeds, as may grow there cut to form an accumulating mulch. All stones should be closely picked up and a surface formed where the wind-fall apples may be saved in good condition to be sent to market where a cheaper grade of fruit is always wanted.

Where evaporators are at hand this dropped fruit would have higher value for drying. Cultivation would then be kept up in the center of the spaces between the trees to make readily available the plant food that is in the soil and to conserve soil moisture.

We believe that it may be possible through this change of culture to reduce the cost of production by thirty per cent and at the same time to obtain somewhat higher color in the fruit. Tillage should be carried only to the extent of obtaining a good annual growth of wood. As soon as this is assured tillage should cease, for size in the fruit will be obtained along with a good growth of wood, especially where green crops are regularly grown and plowed in.

#### FERTILIZERS FOR ORCHARDS.

The subject of fertilizer is one upon which it is very difficult to give advice or even an opinion. The secrets of the soil are many that have not yet been solved and are far from being understood.

This makes fruit culture one of the most interesting lines of work, for there is in it so much to be learned and known, and the longer one continues in the work the more he realizes there is to be discovered and worked out. At "Orchard Farm" we began tree planting on soil that for more than a century had been producing general farm crops, and naturally in that time its original supply of plant food should have been considerably reduced. This fact was discovered in the rather unsatisfactory quality of the fruit that was produced. The question arose, how to most economically bring up a higher productiveness.

For a time we put in sheep and steers and fed for the manure they would furnish, but as there were a hundred acres to be laid out for orchards, it was a slow process to try to produce enough manure to cover so much land.

Commercial fertilizers were attempted but that required more capital than was available to carry out that plan, and their value was not altogether certain on this soil, which is a glacial drift, gravel loam and limestone with more or less of variation over the farm.

It became evident that where stable manure was used more positive results were observed, but as this was not to be had in sufficient quantity, a system of clover culture was attempted for the purpose of plowing in to furnish what the manure added, the humus, which this soil had lost and which it was evident it needed more than anything else.

It was a struggle for several years to get a satisfactory growth of clover; in fact, for three years on the same soil it seemed more of a failure than anything that had been attempted, but there was some gain and the policy was pursued until a most marked improvement began to develop, when what seemed like a discouraging failure began to show promise of real success.

From the time that good stands of clover were obtained, marked improvement in the soil, in the growth of trees, and in the yield and quality of the fruit have been realized.

We have been carrying out some lines of work with commercial fertilizers to cover a period of seven years. Four years of the time have passed. We have used a complete fertilizer, feeling that in so long a period of the production of cereals there had been a depletion of the principal food elements in the soil.

On peach trees there has been a decided showing of results.

On apple trees the results have not been so marked. On a row of Rhode Island Greenings, in an orchard now seventy-five years old, the second year after applying 35 pounds of basic slag for phosphoric acid, 20 pounds of sulphate of potash, and 22 pounds of nitrate of soda per tree, the foliage was distinctly darker green in color than the rest of the orchard. The apples were also of a decided green in color, while on the other trees there was more of the yellow shade, near maturity. The size of the apples on the fertilized row was larger. For the past two years there have been prolonged droughts, with no perceptible difference noted.

In all of the orchards clover is being sown for a cover crop, and plowed in, excepting the past season, when buckwheat was substituted. The first six trees on the fertilized row of apples have made a large growth and have produced more apples than the unfertilized row next to it. Yet there are individual trees over the orchard that without fertilizers applied have made equal growth of wood, and have produced as many and as good apples.

#### SELECT GOOD SOIL FOR ORCHARDS.

Over much of New England, as in other sections, when orchards have been planted, too often land has been selected that was not the best for the farm crops. This has been, and is, a mistake.

The best soil should be selected for trees, for upon such, orchards will make more rapid growth. They may be made to produce profitable crops several years sooner, while the cost for fertilizers may be saved, if good tillage is kept up, combined with leguminous cover crops.

The value of the apple crop is so much greater than most farm crops, that it pays to give the orchards the best land on the farm.

#### SMALL ORCHARDS.

One of the most valuable lessons of the year 1911 is that of the small orchard well tilled. Such have produced in a season of unusual drought large yields of excellent fruit.

A well cultivated orchard of five acres for a majority of growers will produce more profit than larger orchards with

only ordinary care. If in sections where the conditions of soil and climate are favorable for orcharding, every farm should have a five acre orchard put out and given the care it requires, it would produce more income one year with another than the entire balance of the farm. This has been the secret of the success of the orchards of the Northwest. There a vast territory of land is covered with small orchards. Water has to be used in irrigating the land, and as this is expensive, the small acreage is enforced, but they have brought large returns from the high care and culture that have been required under the conditions. Thousands of acres of orchards may now be seen under intensive culture through portions of Oregon, Washington, Idaho and Colorado. Their fruit is being sent into our eastern markets in large quantities and unless we improve our eastern methods, the West will hold the best trade in our eastern markets.

The question is constantly being raised, with the very general interest that is awakened in apple growing,—Is there not danger from over production?

While this may be possible, it is not probable. The same question has been asked for the past half century, and apples are higher priced and much of the time so very high as to be prohibitory in common use.

#### THE PRESENT APPLE CROP.

The crop of the present year is estimated to be about 30,000,000 barrels, which is less than half of what it was in 1896, when 69,000,000 were produced in the United States and readily consumed. From that time to the present the annual production has ranged from 19,000,000 to 44,000,000 barrels, while the increase in population has greatly increased the demand for apples.

In 1909 Maine produced 950,000 barrels of apples, in 1910 900,000 barrels, while the 1911 crop is estimated to be 1,350,000 barrels.

The yields for all of New England for 1909 were 2,350,000 barrels. For 1910, 2,850,000 barrels, and for 1911, estimated 3,150,000 barrels. In New York, which is the leading apple producing state of our Union, the yield in 1909 was 4,100,000 barrels; in 1910, 3,600,000 barrels, and in 1911, 5,200,000



barrels. The total yield of the United States in 1909 was 25,415,000 barrels; in 1910, 24,225,000 barrels, and in 1911, 30,065,000 barrels.

These figures do not show an increase of apples that is anywhere near the increase in population.

The prices for apples for the past few years have been too high for their free consumption by the masses of consumers. The wholesale prices in Boston in the autumn of 1909 ranged from \$3 to \$6 per barrel; in 1910 from \$4 to \$6; and in 1911 from \$2 to \$4 per barrel.

The retail prices are much higher than the wholesale, and many consumers have had to turn to cheaper foreign fruits as they could not pay the high cost for apples.

At many of the retail stores good apples are sold for \$1 to \$1.50 a dozen, while at the hotels one baked apple costs twenty cents, which costs the consumer at the rate of \$60 a barrel.

The retailers and the hotel proprietors claim that to get the fine quality of apples such as their best customers demand, they have to assort often from three barrels to obtain one bushel of really fine apples.

This is why the small orchard for most growers is more desirable, that they may give them better care and produce more of the higher quality that is demanded. For the past sixty days the markets in all of our cities have been over supplied with a large quantity of inferior apples—poor, wormy, undesirable fruit which in some instances has not brought the cost of freight and barrels, while strictly fine apples have been in demand at good prices, from \$3 to \$5 per barrel.

These are some of the lessons of the present year, and they are so full of instruction that if heeded they should be of value in the years that are to come, and if they are, the future will have good things in store for those fruit growers who continue to plant trees and properly care for them.





Portion of Plate Exhibit at Annual Meeting State Pomological Society, Augusta, November 14-16, 1911.

PRESIDENT'S ADDRESS.

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*Members of the Maine State Pomological Society and Friends:*

It is fitting at the opening business session of this our forty-eighth annual gathering that we remember the faces of those formerly active but now absent. Whether they have passed on, or because of ill health or the infirmities of age are not able to join in these services for the promotion of pomology, they should, at this time, be recalled and their devotion to the best interests of the State stir every one to a deeper enthusiasm in preparing for the work of another year. One fact cannot be too strongly impressed, that, in spite of adverse conditions, in spite of drouth, extreme heat and early frosts, the record of 1911 places Maine at the head of all the states in percentage of yield of all crops adapted to this climate. Over and over again has this truth been demonstrated, still we are not yet alive to its significance. It is high time for a complete inventory of our industrial blessings. When that is taken, chief among them will be found the fruit possibilities of the State. It is criminal to paint unnatural pictures or hold out too highly colored inducements, but it surely is necessary that the actual facts be realized as they are not to-day, even by the most successful growers. There is a fruit belt in Maine, the outlines of which must be more distinctly marked. There are varieties best adapted to different localities and these should be determined for the greatest good of future growers. There are soil conditions most in harmony with the best development of specific varieties and these must be made more pronounced by actual tests that future orchards may be rightly planted. This problem of adaptability of soil to different varieties is one of the most perplexing problems facing the student, yet upon its solution will rest the future development of the industry.

There is a method of treatment, which has general application, and will insure health, vigor and highest productiveness to any orchard and this must be made plain. To my mind here is the specific work for this, the only organized fruit body of the State. The holding of annual sessions, the calling together of such grand exhibitions of fruit, not to be excelled on the globe, in quality, the organizing of a program like the one opening before us and the publishing of an annual report is, to-day, not the complete work of a state pomological society.

Our mission cannot be realized until Maine apples stand for something, until we have established a standard in apple culture and are able to maintain it, until we can educate the coming man to grow the best fruit possible, where the choicest is certain to follow right cultural methods.

Before desired results can be obtained certain specific steps must be recognized and followed.

1st. Greater care is necessary in the selection of a site for an orchard. The complications forced by the multiplication of insect pests and diseases and the certainty of further increase necessitate the selection of orchard sites where sprayers can easily be operated, while the heavy loss in Maine during the past ten years by freezing makes prominent the subject of natural or acquired drainage to protect the trees.

2d. It is high time the door was permanently closed against the irresponsible tree agent, and every would-be purchaser urged to confine his orders to a few standard varieties and his trade to nursery men known to be reliable, whose written guarantee can be accepted as adequate protection. Too many orchards just coming into bearing, as well as those older, tell of rank injustice, or worse, on the part of agents or tree dealers. The sale of thousands of trees in Maine the past year, of a well known variety, long after the market was sold bare and a supply could not be obtained, is a form of tree business from which would-be fruit growers must be protected. Every buyer is entitled to a guarantee that every tree shipped is whole root budded or grafted and that the scions came from tested trees known to produce choice fruit and to have been persistent bearers. The element of chance must be eliminated to the farthest degree.



3d. Education is demanded as to what constitutes a good tree for setting, that buyers may discriminate and refuse to accept inferior stock, whether in size, shape, top or root.

4th. The very apparent lack of uniformity in methods of pruning both root and top before setting, suggests a possible series of public demonstrations of immense value, while the necessity for instruction in trimming young trees to insure shape of top desired is forced home upon every thinking orchardist, and must claim public attention.

These self-evident facts make obligatory extended work along educational lines,—work too long neglected and which can best be reached through a well directed campaign for improvement by this organized and state supported society.

The increase of insect pests preying upon tree and fruit, and of diseases threatening serious trouble, will necessitate more stringent measures for protection and more complete supervision by the State as well as far more thorough work by orchardists. The man who does not spray becomes a menace to all the neighborhood, and protection of the industry is paramount to individual fancies or practices. Maine orchardists received last year very close to four million dollars for their fruit, prices ruling abnormally high, yet because of rigidity of laws and practices covering grading, packing and branding in the far West, the growers there realized for the same amount practically twice as much.

The question of quality does not enter here to our injury, for the eastern apple is in every way superior when properly grown and graded. This tremendous loss, resulting from bad methods and lack of supervision, is our greatest drawback, yet all amendments to our fruit packing law, tending to insure a clean pack, true grade and honest brand, and to increase value and price of the Maine product, were defeated in the last legislature through the influence of a few orchardists.

In the second congressional district there are almost one hundred orchards of more than one thousand trees each, while in the third one could easily find as many more, with still others in York, Cumberland, Penobscot, Piscataquis and Hancock counties. In addition, are numberless smaller orchards on every hillside. This output of fruit must be radically increased as the one hundred thousand trees set in 1910, and as many

more in 1911, come into bearing. To-day every indication points to a still larger setting in 1912. All this makes imperative a campaign of education for legislation to protect Maine fruit.

The great majority of our apples are purchased on the trees, or at picking time, by representatives of foreign, or out-of-the-state, buyers, and sorted and packed according to market conditions, not according to law. The commercial standard rules and that fluctuates according to demand and supply. Meanwhile the State and the industry suffer in that these apples are all branded "Extra No. 1. Maine Baldwins" or "Spys," etc., the per cent of No. twos being ridiculously small. It was these apples I saw opened in western Massachusetts and Connecticut last winter, which brought only criticism and condemnation on the State as a whole and every grower therein. No friend of Maine's apple industry can rest until the brand on every package shipped or sold is true to the contents of the same. This much the consumer is entitled to; this the producer must have, to insure income from his orchards.

Individual interpretation of law must yield to standards fixed by state inspectors. The complete vindication of that friend of the common people, Dr. H. W. Wiley, who, as head of the National Pure Food department, has stood for pure food regardless of the most vindictive abuse and opposition, gives promise that under national rulings this practice of deception in packing and branding apple packages may be controlled by Government inspectors. When that day arrives excuses will have little weight and the plea of ignorance no relief.

In view of the defeat of our proposed amendments to the fruit law in the last legislature, allow me to submit the recommendations of 1910 and urge the more complete organization of this society that such as may be adopted, may be publicly discussed and interest centered on these features most important for the promotion of the industry, before the legislature of 1913 convenes.

1st. To provide for a system of inspection by state authorities of all boxes and barrels intended for sale.

2d. To remove the qualifying sections in our present law permitting imperfect and damaged specimens in classes 1. (*extras*) and 2 (*No. 1's*) so that every apple shall be as represented by the brand upon the outside of the package.

3d. To provide for adequate penalty and method of enforcement, in case of violations.

4th. That all agents or representatives of foreign, or out-of-the-state buyers, and all buyers and shippers in the State, be required to notify the Department of Agriculture of the date or dates and volume of proposed shipments and to whom consigned, that the volume of the crop raised may yearly be determined.

5th. That a committee be raised at this session to ascertain the cost of a colored lithographic barrel and box label, to include the seal of this society and allow necessary blank spaces, and report at the next annual meeting, the object being to provide the members of this society with a choice label for use in shipping, and the further advertising of the apples of Maine.

6th. That in view of the alarming decrease in the number of song birds and bees, and with a full recognition of their valuable and necessary services in fertilizing all blossoms, this society, through chosen representatives, attempt systematic experiments to determine the value of non-poisonous insecticides. So serious has become this loss and so tenaciously does the scientist cling to arsenical preparations and combinations that we may well institute careful experiments along other lines to determine, if possible, what agents are effective and not injurious to bees and birds.

To my mind the weakest spot in the whole fruit problem today is the method of disposal of the product. Here and there we find growers who have established a market but the great majority are at the mercy of commission dealers and shippers. So long as this continues, the grower is practically a cipher in disposing of his fruit, simply passing it on to others to accept what they are willing to give. The commission plan as operated by so many today has little to commend it to the grower, and those only with few barrels, and no acquaintance with the market, can longer afford to ship in this manner. The time has come when, for the protection and promotion of the industry, there should be in the State, central fruit growers' organizations, where paid officials shall receive, handle and dispose of the product, protecting from an overstocked market, shipping to most favorable centres, and insuring net returns not possible through individual efforts.

The manager of the California Fruit Distributors, very truthfully says: "Unless your fruit passes through one channel, which has all information in regard to shipments, amounts going into different markets, and the condition of these markets, you will never achieve success. As long as a number of different organizations are in the field working independently, you will always be working at cross purposes and the results are sure to be disastrous. Your own competition will kill the price of your products and this is entirely to your own disadvantage, with no corresponding advantage to the people who buy and handle your products, as owing to this competition there is always uncertainty in regard to cost of goods delivered; and each dealer is afraid that his competitor will be able to get the same goods for less money, and is, therefore, unwilling to take hold and push the business as it should be pushed."

A sarcastic old farmer once remarked that the reason farmers did not co-operate more was that there were too many of them who would rather lose a dollar than see another make two. It will be impossible for growers to realize in the greater distributing centres, as they otherwise might, until their representatives follow the crop to its final destination. The yearly loss to Maine orchardists resulting from lack of attention to just protection in disposal of their fruit reaches hundreds of thousands of dollars and will continue until practical co-operation becomes an actual fact.

The growing consciousness that by and through such organized bodies the future apple grower must unite to compete with the western growers, now so thoroughly organized, places this problem before this society as one of paramount importance. If the New England grower is conservative, and tenacious of what he terms individual rights, that conservatism must be disturbed; if he is, because of the experience of the past, suspicious of others, that suspicion must give way to confidence; if habit has established a method of disposal of his fruit product, that habit must be broken by the introduction of methods and practices now recognized as absolutely necessary in every other department of industrial life.

The individual unit must be lost in the chain of corporate power. One man can handle the product of a thousand orchards at less expense, and insure a better price, than one



thousand men contending with each other in the market. The sudden severe drop in price September 12 to 15 told simply of the indiscriminate crowding upon the market of stock, good, bad, and indifferent, by growers from every portion of New England. A well organized association would have divided and diverted shipments and prevented that glut so welcomed by the commission dealers at the great centres. It was not the result of a heavy crop but of bad business methods in handling. This must continue until growers are brought to see the importance of organizing for protection, and this campaign of education lies legitimately in the path of this State Pomological Society. Important as is the right setting and care of new orchards the burden of obligation is in line of protection of those now planted and the best possible disposal of the yearly product. Because of neglect of good orchard principles there is a tremendous loss to growers, not necessary, but resulting from causes which easily might be remedied. Too many take counsel of their fears rather than their judgment. Reports of the Department of Agriculture show that in the face of a rapidly increasing demand, owing to the growth in population, the annual production of apples in the United States actually decreased more than 138,000,000 bushels between 1896 and 1908, during which period our population increased fully 12,000,000. In 1895 the yield of apples in this country was 60,453,000 barrels and in 1910 only 24,000,000. In view of these facts the fear of over-production may well be discarded.

At the same time, because of the claims made by certain newspaper and magazine writers, it will be necessary to hold constantly before the public the fact that this is no get-rich-quick scheme. A positive and lasting injury is being inflicted on innocent parties as well as the industry, by these writers. Men are giving up occupations and homes, and with little means, and no experience, reaching out to buy an orchard, expecting to pick gold dollars from the branches without labor.

Over and over must the lesson be emphasized that the well cared for orchard will insure substantial returns and is today one of the sanest, safest, and most lucrative investments a man can make, but with this there must go in big type the fact that these returns come only to him who plants, fertilizes, cultivates, sprays, prunes and has constant supervision over each and every tree. Experience is demonstrating that the scope of this



society cannot be limited to the holding of an annual exhibition and one or two field day meetings. Receiving aid from the State it must serve the State in larger measure, as the relations between the grower and the land, and the grower and the market, become more complex.

With this thought I have attempted to indicate some of the specific lines of work, and surely some of the opportunities directly in our path. The supreme thought must be the greatest good of the industry and no step can justly be neglected which can foster and promote it.

The past few years have so jarred old-time standards that the entire system of conducting annual fruit exhibitions has changed. This society has entered a broader field where new features must constantly be added to meet new demands. The public awakening to the value of such an exhibition as now adorns this hall, manifested in the grand list of special prizes offered by the citizens of Augusta, and friends of the industry, must be accepted as indicative of a growing appreciation of the possibilities of fruit growing in Maine and the opportunity for this state society to constantly move forward in aggressive work for the greatest good of the entire State.

The complete success of the second New England Fruit Show at Boston insures regular annual or bi-annual sessions, and exhibitions affording an opportunity not to be obtained in any other manner for substantiating all claims for the superiority of the New England product. If Maine lost in state competition the causes are recognized and will not be met again.

Failure on the part of Maine growers to take advantage of and compete for the liberal prizes offered inevitably placed us at a disadvantage. More public spirit must be injected into the great body that the progressive policies adopted elsewhere may be made to enhance the value of the Maine apple.

What is possible with a live Board of Trade in advertising the industrial work of the State was clearly manifest last week in the complete success of the Corn and Fruit Show at Portland. That these exhibitions will multiply as years pass seems clearly indicated and it behooves the friend of the apple to be alive to each and every opportunity to set before the public the character and quality of the Maine product. Rightly organized, this branch of agricultural work may be radically increased in the next twenty years.

Two years ago at your urgent solicitation, and against my own best wishes, I accepted this honorable position and in accordance with my public declaration at that time shall turn the duties over to my successor at the close of these sessions. The complete harmony of purpose and loyalty of every officer and member have made possible the remarkable exhibitions held and the high character of every session. In this short period of time the scope of our annual exhibitions has been radically enlarged. I bespeak for my successor the same cordial, hearty support so fully accorded me, pledging my earnest co-operation in promoting whatever will best build up the fruit interest of this good old State. That interest is only in its infancy. Wisely fostered and carefully guarded and protected Maine can easily be placed first of all the eastern states in volume of production as it is today in the natural quality of its product. Our objective point must be a live, positive, aggressive fruit sentiment spreading yearly, insuring proper care of all orchards, better knowledge of the principles of cultivation and fertilization, complete protection from pests and diseases by spraying, a wise and effective law insuring a true pack, a clean grade, and honest brand upon every closed package and behind all this thoroughly organized local fruit shippers' associations to lift the burdens from the individual grower and insure fair returns for every package. Then, with ten million barrels yearly as our contribution to hungry consumers we shall, through united effort, make the fruit industry a constant mine of wealth and our praise will be in all the mouths of a grateful public.

"You can climb to the top of the loftiest hill

    If you work;

You can make of yourself whatsoever you will

    If you work:

A faith you must have rooted deep in your soul,

A purpose unshaken, a firm self-control,

Strive on without ceasing, you'll reach to the goal,

**If you work."**

## OUR APPLE PACKAGE.

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By A. K. GARDNER, State Horticulturist.

We are here at this meeting to devise different means of increasing our standards in fruit work and to demonstrate that we have profited by the lessons learned in past years. In some cases the results have not been as good as expected, but on the whole, we are advancing very rapidly and in the right direction.

Our fruit is more uniform, cleaner and better packed than at any previous meeting, and, while we must improve our methods still more, we have reason to be proud of this showing.

The different phases of orchard management have been discussed and rediscussed, with the result that there is a growing tendency in all sections to improve and better the handling and growing of fruit.

More growers each year are finding the advantages of clean culture in their orchards; in the increased vigor of the trees, and in the size, quality and amount of the crop. Most growers are practicing intelligent methods of pruning, taking out the superfluous branches and giving the fruit a chance to color thoroughly.

Spraying has become a necessity and more and better grade pumps are being installed each season, insuring more fruit free from worm-holes, stings and fungous growth.

In fact, all the branches of orchard management are receiving increased attention, with the result that our crop this year contained a larger percentage of choice fruit than in any past year.

Now comes the question of marketing. We have trouble each year in disposing of our fruit at even normal prices, because of the fact that dishonest methods have been indulged in too freely during the past few years. Poor grade apples have been mixed with the choice in order to dispose of them, and

they have constituted a large portion of the crop where spraying has not been practiced. Large and small fruit have been mixed indifferently throughout the barrel and grading has been an unknown quantity. In order to pack apples properly, whether in boxes or barrels, careful grading must be practiced. Not only does this mean that all the wormy, bruised and imperfect fruit must be culled out, but it also means that the perfect fruit must be graded, as to size and color, so that when the pack is completed the apples will be uniform throughout.

Often the grower says that his other work does not allow him time to be so fussy with his apples, or that he can get just as much for them from the buyer and doesn't have to worry over disposing of the culls. This may be partially true, but if a man is in the apple business to stay, he must establish a reputation for honest work; if he is not in to stay, the fruit business would be much better off without him. Successful fruit growing is not, and never can be, a side issue to some other branch, for it demands careful and constant study and intelligent application of principles.

In the West the Unions send out their own packers headed by a foreman whose duty it is to see that the fruit is properly graded as it comes to the packing table. No grower is permitted to pack his own fruit, and it is to this precaution that the high prices for western fruit are partially due.

In connection with grading, I think that all choice and fancy apples should be wiped before they are packed. Where the spray adheres to the fruit, it presents an unattractive appearance and cheapens it in the eye of the consumer. If the fruit is bright and attractive, more people are influenced to purchase, with the result that there is an increased consumption, and, consequently, an increased demand.

Demand is what we are looking for and we will never be able to increase that rapidly by putting poorly colored, poorly graded and poorly packed fruit on the market.

Although the barrel has been used exclusively in marketing our apples up to the last few years, yet now the box is becoming more and more popular for the fancy grades of some of our varieties. The success of the box for the western grower is clear, and it is because of this that growers are gradually giving up the idea that the barrel is the only feasible package.

Trials have been made in many cases and the conclusion reached that there is not enough real difference in the financial return to warrant the extra expense of material and packing. This may have been due to various causes:—

I. The boxed fruit may have been poorly graded, with too many inferior apples, and too many sizes of fruit used.

II. The apples may not have been wrapped.

III. The pack may have been such that the fruit did not reach the market in good condition.

IV. Inferior varieties may have been tried.

V. Large fruit may have been tried where the difference in price would necessarily be small.

First, let us take up the difference in cost of packing the box and the barrel.

Our barrel at the present time costs any where from 30c-45c, at an average cost, say of 35c. It will cost about 7c to pack the fruit and head it, making a cost of 42c per barrel, or 13c per bushel.

Our box costs from 11c-23c, but should average not over 15c in shooks; it costs 1c to make them up, 1c for paper and 5c to pack, making a total of 22c per box, or 66c per barrel of fruit.

Comparing the two, the cost of packing a barrel would be 42c as against 66c for a like amount in boxes, or a difference of 24c per 3 bushels fruit. In order to offset this difference, the box must realize 8c more per bushel.

Now what advantage has the box to offset this difference:—

I. The box demands better grading.

II. There is a demand for the smaller package in fancy grades.

III. The amount of fruit in the package is exact.

IV. There is less chance for spread of decay.

V. It reaches a more fancy market.

In box packing the grower has to handle each apple separately and even if some inferior fruit gets by in grading, he will be apt to discover it when placing it in the box. The eye will detect the fruit that is too green for uniformity of color and keep it separate for a different pack.

Different sized fruit is sure to spoil not only the appearance but also the stability of the pack. Green fruit should be placed in packages separate from the blushed, even though the



size and variety are the same. In competition for prizes at the fruit shows, there is nothing that will be scored harder than green fruit in the bottom of the box.

Again, to obtain a good pack with the right bulge, all the fruit in the box should be the same size. The impression that larger apples have to be put in the centre of the box is wrong, for if the right pack is selected the natural crowding in of the fruit to the centre will cause it to spring sufficiently for a medium bulge of 3-4 in. to either face.

When the consumer demands a fancy apple, the smaller package is desirable. It takes up a much smaller amount of space, is easier to handle and more attractive. In many cases the fruit is not consumed rapidly enough to prevent a part of a barrel from spoiling and there is less loss of fruit in the small package.

Again, when a box of fruit is purchased the exact number of apples is printed on the outside, so that the price of each apple can be readily estimated.

There is less chance for spread of decay if an apple is bruised during shipment, as the papers protect the remainder.

The box must be used for the fancy trade, where the fruit will return a good price. In this way the grower can build up a reputation with the consumer who is willing to pay for what he gets providing it is A No. 1. A few years ago apples at ten cents apiece were unheard of and no one would have been willing to pay such a price for a single fruit. Gradually, however, the standard has been raised and the consumer educated to the fancy stock. By making the fruit more attractive, the consumption has been increased, insuring a greater and more even demand, with the result that the price has doubled and trebled.

Now, let us return to some of the mistakes that have been made in trying out the box and barrel in practical tests. Take poorly graded fruit for example. Suppose we take a certain number of boxes—say fifteen—and barrels to correspond in quantity of fruit,—five. These apples are of the same grade and will sell for say 10 each at the retailers. If it is medium sized Baldwins, for instance, that will mean \$1.00 to \$1.25 per box for the retail price. When the middleman's profit and the

commission are taken out, the results are very unsatisfactory to the grower and the barrel is decidedly the better package.

Again, suppose the apples are of very fair quality, but are of various sizes, some selling at 1c and some at 5c. The grower will not realize much more than he would in the previous case on the box, and again the barrel is superior and more satisfactory, because of the smaller cost of handling.

But suppose the fruit has been carefully graded as to size and perfection, so that the price is 5c each to the consumer. Here the box is worth from \$5-\$6 and should net the grower at least \$3 or \$9 for three boxes. Now, in some cases barrels net the grower as much as \$9, but more often \$4-\$6 is nearer the mark.

When a grower puts such a grade on the market, he establishes a reputation for himself and in a few years can dispose of his fruit f. o. b. at a high figure. This may sound like theory and fairy tale and might end with the words, "And he lived happily ever after," but it has proven to be true in too many cases to deny.

Mr. Marshall of Fitchburg disposed of his crop of fancy McIntosh this year at \$3.25 per box f. o. b., simply because his fruit was very carefully graded and packed. What he has done others can do and many in this State are doing the same thing. In this case the box is easily the better package.

All boxed fruit should be wrapped. The paper not only prevents the spread of decay, but also keeps the fruit from slipping and sliding during transportation, insuring a neater and more attractive appearance upon opening. When a man becomes familiar with wrapping, the box can be packed just as rapidly and often more so as there is less slipping after the tier is nearly completed, the paper holding the fruit firmly in place.

It is not the custom to wrap the barrel fruit in paper because of the great expense, consequently it will not reach the market in as good condition; this is especially true of such varieties as the McIntosh and Jonathan which bruise very easily.

That the poor condition of the fruit on arrival is due, partially at least, to the manner of packing was clearly seen at the Boston Fruit Show. Fruit of the same quality and size was received in both good and bad condition even when shipped by the same methods and equal distances. On inspecting the pack,

however, we would find that one man had used the right pack, the apples fitting closely; that the other had either used the wrong style of pack or had not used any care in packing, allowing the fruit room to move about and bruise. This was more often the case, too, when papers had not been used. After a little experience the grower can tell at a glance which style of pack to use and will know whether or not layer paper will be necessary in order to get the right height of ends.

The question came up as to whether or not all varieties are fit to pack in boxes. Personally, I do not favor the idea of trying to pack some of our inferior quality varieties in boxes. The Ben Davis, Gano, etc., seem to me better adapted to the barrel, especially since they suffer comparatively little harm from hard pressing, and are fit for long transportation.

While it is the general impression that only large fruit is produced in the West, I think you will find upon looking into the case, that it is the medium sized fruit that is being chiefly shipped. Apples that will pack less than 88 to the box are considered too large for commercial work and it is easy to see why. Suppose we pack apples that run 41 to the box. That means we will have to receive about ten cents retail apiece in order to realize as much as we would on apples half as large at five cents apiece. Now, the apples that are sold for ten cents apiece are limited in number and the demand for such fruit is not increasing very rapidly. On the other hand, if such fruit is sold at the rate of five cents each that means only \$2.00 per box with the middleman's profit and the commission man's fee to be taken from that.

For this reason I believe that the extra large fruit must be shipped in barrels in order to realize the greatest possible returns. As it looks to me at the present time, the choice and fancy fruit that is not too large should be shipped in boxes; the poorer grades, inferior quality varieties and extra large fruit should continue to be shipped in barrels; and no matter what package is used we should grade each apple honestly and conscientiously.

MR. POWELL: I want to ask one question, in reference to wiping our eastern fruit. Of course that is the practice of the West, and the question occurs to me whether taking the fruit from our eastern orchards, it is going to be necessary to wipe

the fruit. Now many do admire, if it is possible to get it, the beautiful bloom on the fruit here at the East. At the West, of course, with the heavy spraying, much of the fruit has to be washed in order to get off the lime and hence wiping necessarily has to follow. But the question is this,—If we wipe the fruit does it have as good keeping quality? That is the point I would like to have brought out.

MR. GARDNER: Why, no, I don't think it does; but provided it has been properly sprayed during the season I don't see that the keeping quality would be very much affected. As we are situated here, with the brown-tail moth, it seems to me that the fruit should be wiped. Our spraying for the brown-tail ought to come somewhere around the first of August, and it is a question whether or not there is any poison from that. In most cases, where we are not troubled with the brown-tail and do not have to use the arsenate of lead spray, of course it would not be necessary. The fruit is certainly superior with the natural bloom than without.

MR. CASTNER: I would like to answer Mr. Powell's question. Wiping western fruit is being done away with. The apple buyers, buying the crop, do not wish it wiped. We realize that wiping interferes with the keeping quality of the apple. There may be parts of the West in which they are wiping fruit, but with us in Hood River Valley it is not practiced any longer.

MR. STAPLES: What so far has proved to be the best spray for the brown-tail?

MR. GARDNER: Arsenate of lead.

WEDNESDAY AFTERNOON.

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RENOVATION OF OLD ORCHARDS.

MR. GEORGE C. DREW, Greenwich, Conn.

Until a comparatively few years ago the neglected apple orchard was a part and parcel of most New England farms, and I doubt if Maine was an exception to this rule. I said until a comparatively few years ago, because lately there has been such a systematic revival of interest in orcharding in general that it has called attention to these orchards formerly profitable but now neglected and going to decay. Unfortunately there are still many whom this revival has not converted, many who still believe these old neglected trees have served their day and their usefulness is past. I have been asked to speak on how these abandoned orchards may be reclaimed, how they may be once more put on a profitable business basis.

About seven years ago, as manager of an estate, I had charge of consolidating a large tract of land, buying up farm after farm as opportunity offered. These were all typical run-down New England farms,—each one of which had at least one orchard in various stages of neglect. In some cases canker was abundant, while in others San Jose scale had nearly ruined the trees; in all cases, such things as pruning, spraying, cultivation, and fertilization, had either never been practiced, or had been neglected for years. Some of the orchards, while comparatively young, had been so stunted as to be nearly ruined, while others were the old veterans of fifty or more years, with high tops beyond the reach of sprays or ordinary ladders. Such were our problems,—the problems, I am led to believe, of at least some of you. I must confess that at first I was somewhat sceptical as to results and in one case had even started to cut down the trees as too hopeless to even think of renovating. Fortunately I had the means and time available to work out the problem and now I would never cut down an old orchard unless it was in an extremely hopeless state.



*Pruning.*—It is quite a task to thoroughly renovate an orchard long neglected, and it cannot be accomplished in a day; still, it is often surprising to see how quickly it will respond to a systematic method of treatment. Let us consider the matter of pruning. Most of the old orchards were planted with the idea of cropping underneath,—consequently the lower branches were pruned off, so that we have long trunks and high tops. Under present day conditions we want the reverse,—low down, spreading trees, so that they may be more easily and cheaply sprayed, the fruit more economically harvested, and the danger from high winds greatly lessened. As most of these old orchards have been pruned up, our problem is how to get them pruned down. I have tried all methods, from cutting back to mere stubs in extreme cases, to simply heading in the more upright center branches. Where there is a severe infestation from scale and where the trees have been pruned up so there is an extremely long trunk, this radical method, with various modifications to suit different conditions, is advisable. In fact, in such cases, severe heading in is absolutely essential, as it is practically impossible to eradicate the scale in the high tops of old trees. The amount of heading in a tree can withstand will surprise one who has never tried it. I have cut off from twenty to twenty-five feet of the top in extreme cases and branches from eight inches to a foot in diameter. Generally it is advisable to cut back the top the first year only a part of the distance it should ultimately be reduced to, not leaving the center of the tree open to the too direct rays of the sun. This cutting will cause water sprouts to start out on the limbs or trunk lower down and after a year's growth, these have a tendency to fill in the space. The top can then be reduced as originally planned, the water sprouts thinned out and headed in. In a great many cases, however, all that is needed to form a low-down top is to head in the main center upright branches. Check the growth here and it goes to the sides. After a little experience in forming the head, one can get the graceful drooping appearance in two years' growth, where only this small amount of heading in is required. Old trees long neglected are generally a tangled mass of branches; cut out all dead or cankered limbs, take out the worst of the cross branches, but do not attempt to completely shape the tree in one year. In all

cases our aim should be to get clean, new, vigorous bearing wood.

*Surgery.*—Cover the wound with some protective compound like coal tar or good lead paint. Do not be content with doing this once; two or even three times may be necessary so that decay may not set in. If there are cavities, dig out all decayed substance to solid wood, thoroughly tar, and then seal with cement, or otherwise exclude the water and elements. Cement is, however, liable to crack and it is advisable to cover with zinc or paint with tar. If there are bad forks or the tree is liable to split, bolt the trunks and use cable wire higher up in the branches. Bolts put through the limbs to hold this cable should have large washers and be threaded well up so that the slack can, if necessary, be taken up from time to time.

Most of our old orchards were either Baldwins or Greenings, so that the variety did not require changing. But in other cases where the varieties were undesirable, after reducing the top, grafting had to be resorted to, to make the venture profitable.

*Spraying.*—After the pruning and surgery have been attended to, the subject of spraying must be considered. Most of these old orchards had a severe infestation of scale,—some of the trees were in a desperate plight indeed. When the tops had been reduced so as to be reached by sprays our problem was much simplified. Still the first orchards were hard to clear up and it was generally two years before we had the scale under control. Now I am practically able to clear up an orchard in a single season, but not always with a single application. To accomplish this in so short a time, the work must be done thoroughly and when conditions are favorable. Oils, in my experience, are to be preferred to lime and sulphur when the scale is very abundant, as oils will spread while lime and sulphur only kills where it strikes. Lime and sulphur, however, has a wonderful effect in cleaning off the old bark and fungi, and even were there no scale in a neglected orchard, I would consider it a paying proposition to spray with this solution in the dormant season. A combination I like very much is to spray in the fall with the oils and then just before the buds unfold in the spring, spray with lime and sulphur.

*Summer Spraying.*—I have not touched much on spraying in the summer time, because I have been speaking of putting the trees in shape. We are adopting, as I suppose almost everybody else is adopting now, lime and sulphur with arsenate of lead as a summer spray.

*Cultivation.*—Wherever possible I believe in cultivating an orchard. Those neglected are always found in sod. In many old orchards the roots are too near the surface to plow. In such cases use a disc or cutaway harrow to break up the sod, and follow with the spring-tooth to maintain the surface tilth. If the trees are low down, as I advise, cultivate the spaces between the trees,—do not attempt to crowd in under the branches, as the active feeding roots will be as much benefited without it. While I strongly believe in cultivation, I also think at times it is advisable to seed down to a good clover sod to check a too rampant growth and also to aid in developing a higher colored fruit. I then cut the clover and let it lie where cut. I would let the orchard remain in sod until the growth of the tree or the character of the fruit indicated it should be broken up again.

*Fertilization.*—In all my orchard renovation work I have used chemicals instead of stable manure, although undoubtedly the latter will give excellent results if supplemented by such chemicals as supply potash and phosphoric acid. I buy and use chemicals in the raw state, rather than any particular brand of mixed goods. You are then sure of what you are getting and it is the cheapest in the long run. In various orchards I have used sulphate of potash, nitrate of potash, ground bone, wood ashes, nitrate of soda and basic slag. My main reliance has been, however, on nitrate of soda for the nitrogen, sulphate of potash for the potash, and basic slag for the phosphoric acid and lime. I prefer potash in the form of sulphate to muriate, although more expensive, because muriate robs the soil of lime. Phosphoric acid as supplied by basic slag seems to me much superior to acid phosphate, as I believe in sweetening the soil rather than souring it. The amount and proportion of these chemicals to use are problems for the individual grower. I would not attempt to prescribe. One can only determine by experiment. The color of the foliage and results of the harvest are good criterions to go by. In a general way I have used

on our soils when starting to renovate, about one hundred pounds of nitrate of soda, two hundred to two hundred and fifty of sulphate of potash, and four to six hundred of basic slag, per acre. Later I have used only a slight amount of nitrogen, one hundred to one hundred and fifty pounds of sulphate of potash, and three to four hundred pounds of basic slag, per acre, as an annual dressing, whether there were prospects for a crop or not. I have, however, when practicing clean cultivation, used legumes as a cover crop to furnish additional nitrogen and humus.

*Thinning the Fruit.*—For the past four years I have made it a practice to thin the fruit from all my bearing trees at least once, sometimes twice, during the growing season. This is quite a task, especially on older trees, still I consider it extremely profitable. It not only guarantees growing the choicest fruit, but it saves the tree from a useless strain. It is not so expensive as one would imagine who had not practiced it. I would say on an average, trees bearing seven to eight barrels of fruit at the harvest have cost us about fifty cents per tree to thin—not so expensive when you consider that choice fruit is the kind which brings the profit.

*Time Necessary for Renovation.*—Here, of course, we can only generalize. Where only a moderate amount of topping and thinning is necessary, one should be able to get good results the second year. In several cases I have in mind with such varieties as Greening, Northern Spy and Roxbury Russet, where the fruit was ill-shapen, with hard cores, and unsalable except for cider, we were able the second year to win first premiums on fruit from these same trees at our State fair. If more severe treatment has to be practiced, four or even five years may be required before a large yield can be expected.

*Cost of Renovation.*—Here again it depends so much on the size and condition of the tree, infestation from scale, etc., that we can only use an example by way of illustration. It may cost anywhere from one to five or more dollars per tree. Where there is no infestation from scale, the variety is not to be changed, or the tree does not have to be too radically cut back, the cost is comparatively small and need not deter any one. When the more serious conditions prevail the expense is relatively higher. Take for example a Baldwin tree, some



forty years old, with a spread of about thirty-three feet, comparatively high top needing to be headed back say six to eight feet but leaving plenty of bearing surface, the tree rather badly infested with scale and in neglect; I would figure about as follows to put the tree in good vigorous paying condition:

Cost of spraying material .....	\$1 00
Cost of applying same .....	1 00
Cost of pruning and surgery .....	1 00
Cost of cultivation and fertilization .....	75
	<hr/>
	\$3 75

*Results of Renovation.*—I have in mind one of our orchards of two hundred trees, some forty years old, Baldwins and Greenings predominating. I had been told that not more than one hundred barrels of inferior fruit had ever been harvested from it in a single season. The Baldwins generally required severe topping, the Greenings a great amount of thinning. Scale was entrenched on every tree. Three years afterwards we were harvesting eight hundred barrels of choice fruit from this same orchard and it has borne regularly ever since. Another illustration I might cite is of a Baldwin orchard about twenty-five years old. Only a moderate amount of topping was necessary but the scale infestation was most severe. Three years after starting treatment we were harvesting on an average nine barrels of choice picked fruit per tree, while formerly it would not have yielded more than two barrels of inferior fruit per tree.

When you stop to consider the time and money it takes to plant an orchard and get it into profitable bearing condition, the value of these old trees if they can be renovated becomes more evident. In a recent bulletin issued by the Rhode Island State Board of Agriculture is a most interesting article giving the estimated value of apple trees at different ages. Taking Baldwins and Greenings as standard varieties, some correspondents place their value at forty years even as high as one hundred and fifty dollars per tree and at sixty years at two hundred and fifty per tree. Others figure from ninety to one hundred and twenty-five dollars at those ages. If they were in good vigorous bearing condition, undoubtedly they would pay good divi-



dends at those figures. But even at a much lower valuation,—say from twenty-five to fifty dollars per tree at forty years one can readily see what a valuable asset they would be to any farm.

To sum up then, in handling an old neglected orchard my experience would lead me to advise you:

First: Get your trees low down, or comparatively so, where they can be handled economically.

Second: Clean out the scale, if you have any, besides cleaning off the old fungus-laden bark on the trunks.

Third: Get new bearing wood on the trees which have long been stagnant, and keep the trees in good vigorous growing condition.

Fourth: Look out for cavities and decayed places in the trunks and limbs. Clean them out to solid wood and protect from further decay.

Fifth: Practice thinning your fruit in the summer time even though the cost is considerable. It is the best paying proposition I know of.

Sixth: Spray thoroughly, harvest your fruit with care, pack it honestly, put it on the market in attractive shape.

### CONCLUSION.

Orcharding in New England is getting to be a great specialized industry. The areas now being planted with young trees are very extensive, which is as it should be, for those who go at it rightly. It is, however, no get-rich-quick proposition. Time and patience are required. There are many who fear it will be overdone. While I am not one of these, I realize the strategic value of an orchard already established. This is why I make my plea for the old neglected orchard—in a great majority of cases it has the power to “come back.” If given intelligent care, its recuperative powers are such that even the most sceptical will be convinced if they proceed along these lines.

Ques. Did I understand you to say that the summer spray was the self-boiled lime and sulphur?

MR. DREW: Yes.

Ques. No cooking at all?

Ans. No cooking except what is done with the heat of the

lime. We use Scott's formula. For peaches, 8-8-50; for apples, 10-10-50.

Ques. How do you mix that?

Ans. For the self-boiled lime and sulphur, we simply put ten pounds of stone lime into a barrel and sift in ten pounds of sulphur and cook that sulphur by the heat of the lime,—let it cook there until it forms a sort of orange precipitate, then we drench it with cold water so as not to let the cooking go too far, otherwise there is a little danger that you might burn the foliage with it. A person easily gets experience and knows just the color of the orange precipitate at which it should be cooled.

Ques. How much water do you use in the first cooking?

Ans. Just enough to slake the lime in good shape,—a very thin whitewash.

Ques. Do you cover it?

Ans. Yes, just to get the heat out and not let it burn.

CO-OPERATION THE NEED OF THE HOUR--FOR  
PRODUCER AND CONSUMER.

HON. GEORGE T. POWELL, Ghent, N. Y.

*Mr. President, ladies and gentlemen:*

It is one of the great vital problems of the present time for the producer to get the value which he should receive out of his investment and the labor upon his land. We have heard a great deal about co-operation. There has been a great deal written upon it. It is very largely advocated at the present time as the one means of reducing the present high cost of living. We as a nation, for upwards of a century, were the best fed and the cheapest fed people in the world. But within the past few years there has suddenly come over our country an unusual advance in the cost of all food products. So great has been the advance in cost that it has brought consternation and alarm to thousands of consumers in our cities who are entirely dependent upon the foods produced from the land not only for their comfort but for their existence. And this extreme advance in values has attracted the interest of our entire country. So great has become the problem that a commission was appointed in Washington by Ex-President Roosevelt, after he had called a conference of the governors of the states, to take this entire problem under consideration,—the conservation of our natural resources, but very particularly the conservation of the fertility of the soil.

Our producers have had two problems to contend with. One has been the steadily declining productive power of their soil, and the other has been the increased cost of production. And hence it becomes a most vital problem to know how best to meet these conditions. For more than sixty years co-operative work has been going on in certain portions of Europe. Something like sixty years or more ago, in England, or rather in Scotland, a few poor weavers came together, I think about seven in number, and they proposed to put their small earnings

together and go to one of the retail grocers to see if it would be possible if they all paid cash to save a few pennies on their purchases. This was done, and the request was granted. There was some slight reduction in cost for the payment in cash for the purchases, and from that small beginning very extensive co-operative organizations have been formed in Europe which have brought back to the people who are co-operators a very important relief from the higher cost to which they had been subjected.

Now in our country it has been more difficult for co-operative work to be inaugurated for the reason that we have been such a great country; we have done things on such a great and wholesale scale, that it has been difficult to concentrate, particularly with our producers of food products, along these co-operative lines. The only really successful co-operation, perhaps, to which we can point is in the Northwest. There is at the present time in California an organization known as the Citrus Fruit Protective League, which is working along the co-operative line with wonderful success. That great organization, which is doing business at the present time to the extent of millions of dollars annually, has been enabled to bring to the growers of oranges and lemons and other citrus fruits very much more money than they had received before they went into this co-operative organization. At the same time it has been possible for them to so distribute their products over the markets here at the East, our entire country and foreign markets, that they have been enabled to furnish the consumers with all these choice fruits of California at a somewhat lessened cost to them. Now there is one illustration of how co-operation in our country has met with eminent success.

We may also point to the illustration which comes to us from our western fruit growers in Oregon and Washington and the western states, where the fruit industry has been recently organized upon a large scale. The reason for the great success of our western fruit growers lies in this fact, and I want to say here that I believe that the best fruit growers in this country, the most successful fruit growers in our United States, will be found in this great western and northwestern territory. They do so comprehend and understand the necessity of working together along these co-operative lines that

they are making an absolute success in their work in this direction.

Now why is co-operative work successful at the West and so difficult to inaugurate here in the East? In the first place, when this western land was taken up in these great northwestern sections, the fruit growers who began to plant orchards realized that they were at a disadvantage, being so far from market. When they undertook to ship the products of their orchards as individuals, the high cost of freights, the cost of handling their products and getting them into our eastern markets, used up absolutely all the profits there were in the business. They could get nothing out of their business so long as they attempted to ship here to our eastern markets upon the basis of the individual grower. Realizing this fact they came together as growers. They organized fruit growers' associations or unions. They entered into a compact that they would put their product together. More than that, in addition to agreeing to have their fruit packed together upon this co-operative basis, they established other rules and regulations. They at once realized that it was important, shipping such long distances and at a high cost in any event, that they put only the very best product in the eastern markets, and hence they established rules for grading and packing. They established the size of the box. They established standard grades. They required the packing of all of their fruit to be exactly to the standard that was branded upon the box. Now individual growers could not do this by themselves, but they could do this just as soon as they combined or organized and set up certain standards to which they should come in the grading and packing and selling of their products. More than that, they saw the necessity of producing fruit of the finest quality, and hence among their rules and regulations was incorporated the obligation upon every member of their union to spray his trees, to keep his fruit absolutely free and clean from insect blemishes and from the fungus troubles which they have at the West even more than we have here in the East. And hence these intelligent men, when they found themselves off there on the western coast, so far from our markets, saw that their only salvation was to work along these co-operative lines. I think I may say here this afternoon, there has been no co-operative work in this



country that has ever succeeded except that which came through necessity. And that is why our western brethren in fruit growing have been so successful,—because they were forced by necessity to work along these lines.

Now let us look for a few moments at our eastern conditions. To my knowledge there has never yet been a long established or successful co-operative organization anywhere east of the Rocky Mountains among fruit growers. And why? Simply for the reason that here in the East, right side by side with our orchards we have a ready market, and up to this time it has only been necessary for the fruit grower to pack his fruit and send it to market in order to get something for it. It has not been essential, as he has thought, for him to spray his trees until within recent years. He has not been forced to spray until the diseases have made their appearance and until insects have so increased that it has made a large proportion of his fruit poor and wormy—it has only been through force of these conditions that the eastern fruit growers have within the last number of years taken up spraying. Here again we see necessity is forcing better methods upon our fruit growers of the East in the general increase and spread of insects and also of fungous diseases. We may consider, perhaps, that the San Jose scale has after all been a great blessing, because, as it has made its inroads step by step over our fruit territory, the owners of trees have been forced to take up this problem of spraying, and hence we may think that instead of being a calamity the San Jose scale is absolutely a blessing, because this is going to lead us up step by step now to other measures of work which we stand in need of performing here in the East.

So extensively has the western fruit been brought into our eastern markets, with its beautiful color, with its exceedingly attractive packing, that steadily, degree by degree, western fruit has taken its position in our markets. It has simply taken the lead over everything that is brought here into our markets by way of fruit, particularly of apples. Now that is making trouble for the eastern fruit grower who is careless in his methods, who for years has been sending to the market anything that grew upon his trees regardless of quality, of grading, or packing. The eastern fruit grower can no longer go to his orchards, pick his fruit, put it all into barrels regardless of

quality, and get anything out of it by way of profits. So up to this time, for the reason that it was so easy simply to pick his fruit and ship it to any of these near-by markets of which we have so many here through the East, the eastern fruit grower has not felt it necessary for him to work along any lines of co-operation.

But I believe the time has come now for co-operative work; and I have been very much interested since coming here at this time to learn of a few young men not very far from here in Maine who have formed themselves into a co-operative association. These young men have thrown the interests of their orchards together. They have adopted the western system of grading and packing. They are using the box instead of the barrel, and they are shipping their fruit into your markets here and receiving values far above those which are generally paid for other fruit. Now I believe the time is coming rapidly as the result of such meetings as this, where there have been such splendid demonstrations given in the packing of fruit, and where there has been such a magnificent exhibit as is seen here at this time, when more of co-operative work will be done. The evidence is before us that you can grow here in Maine and throughout New England a quality of fruit that will equal the finest that comes from any portion of the United States, not only in point of size and color, but when it comes to quality it leads the world. Now as fruit growers it is only necessary at this point to take the right steps, and those are to form yourselves as fruit growers into fruit growers' unions; then to adopt a rigid system of practice which must be insisted upon by every member. Now this is going to be a test, to agree to come into a co-operative association and abide by an agreement. I believe in order to succeed in this matter it will be necessary to make some very cast-iron rules. For instance, one of the requirements in the western organization is that a contract must be signed by the co-operators, by the members of these unions, that they will turn their whole product into the Union. No individual is allowed to pack his own fruit at the West, just as we have been told here, I think, this morning by the very skillful, expert packer, whose skillful work interested us so much. No individual can be allowed to pack his own fruit. And why? Simply because there is so much difference of

opinion among the individuals as regards the standard to which they would pack. This cannot be left to the individual. It must be determined by the Union itself. Its rules and laws must be fixed and then its members must subscribe to the rules by contract. At the West if any member who has signed a contract to deliver all his fruit to the packing house, or to have it packed by the Union, by any means withdraws his fruit and sells it to some one else, who he thinks may pay him a little higher value, he is fined so much for every box of fruit that he sells. He has to pay the penalty for the violation of his contract by paying a fine which is collectible.

So I believe that in the organization of co-operative unions here in the East, it will be important that in the formation of the organization there be absolutely rigid contracts drawn which every member will have to subscribe to, that he shall not be tempted to let his fruit go to some buyer outside who may come and possibly offer him a little higher value than he thinks he may get through his Union. This will be an entirely new line of work for the eastern fruit grower to take up, but I believe that it is the only salvation of our eastern fruit growing interests, and that just as soon as that is done, and we put ourselves along these lines of organization, and put up our fruit as this is put up here before us today and send it into our markets, we will have the lead of the markets of the East absolutely and the West will find it will be unprofitable to send so large quantities of its fruit here as is being done at the present time. Why, the western fruit growers already recognize this fact. I have the most profound respect and admiration for the fruit growers in the West. They are splendid business men. They see the danger that confronts them in this eastern development when it shall be put upon the lines of co-operative work. I was very much interested last week in the great Land Show at New York in Madison Square Garden, in seeing eastern people go to the managers and directors of these different western exhibits and ask this question: "Your fruit is beautiful in color, it runs fine in size, but is the flavor of your fruit equal to that which is grown here in New York or in Connecticut?" I want to say that these men were honest and they stood and shook their heads. They all recognized the fact, and said so, that we had the best of them in point of quality. And that is what the

western fruit grower says today, and as soon as our business is put upon this basis, we will find a large number of our western fruit growers coming back here and seeking eastern land upon which to grow fruit, because they know the great advantages which we hold here at the East as soon as we adopt western methods. I discovered that many of those western fruit growers believe that the great future of this country in fruit culture has its highest value here in our eastern land.

Another point which is of great value in co-operative work is the legislation which it is possible for fruit growers to obtain when they are combined in organization. At the West they have no difficulty about careless neighbors, because every western state has upon its statute books today laws that are rigidly enforced against insect pests and diseases. It is only necessary for any fruit grower in the West to receive notice that he has insects upon his trees that are injuring his fruit which he must attend to promptly—it is only necessary to receive a notice from the county commissioner, or the county inspector, and when he receives such notice he must move promptly to treat his trees. If he does not do it, it is done by the county commissioner and the cost is assessed upon his property. This is one of the great advantages which come from co-operative work, that when a good law is obtained there is power to enforce it in the community. Now you and I who try to take excellent care of our orchards are continually called upon to meet a large expense through the carelessness of our own neighbors. For instance, I will cite what occurred in my case this last year. The San Jose scale had been introduced, unfortunately, upon some nursery trees in two or three different plantings, undiscovered by the nurseryman, undiscovered by myself, until several years afterward we found that in different parts of the farm the scale had got in and was spreading. And of course when you once get it on your place it is like the poor, you always have it with you. Now we have sprayed exactly as Mr. Drew has outlined here this afternoon. We have used the soluble oil sprays. We had it as we supposed fairly well cleaned up last year. Our trees bloomed, the fruit was beautiful and clear until along about the middle of July when we discovered here and there a little appearance and increase of the scale again, and in going through the neighborhood and examining the trees on all sides



of my farm I discovered that they were badly infested with scale. On some of the young trees the scale was so thick it was utterly impossible even to see the bark. Millions of young scales were constantly moving about on these trees, birds were lighting into them and flying over my own farm from the borders, and the wind perhaps had been carrying them to a certain extent. There was infestation on all sides from the neighbors who have only a few trees and yet have no interest whatever to spray them. I am glad to say that in New York State we have at the present time a similar law to that in the West, where it is obligatory upon every owner of trees to spray them, and if a complaint is entered, the state authorities now have power to step in and oblige the owners of these trees to spray their trees or the State can do it and assess the cost upon their property. I am very glad to say that New York has this law and I trust not far in the future it will be the legislation upon the statute books of every state in New England.

Now comes another phase of this discussion, and that is, How is it going to be possible for us as fruit growers to get higher value out of our products? This, I think, is one of the most difficult problems which we have to meet today. In the first place we can never bring to ourselves the lessened cost which we feel that we must secure in our business until we organize. We need to organize along these co-operative lines in buying the supplies for our orchard work. We need to organize in associations or unions and instead of buying small quantities of spraying material and fertilizers buy together as an organization and in so doing we shall get all the materials which we have to use at the lowest possible cost. Now this is one way in which we can reduce the cost of production and receive a little larger value from our product.

Another very important problem is how to get our products more directly before consumers, and this is a difficult problem. We have heard a good deal of criticism, of course, against the commission merchant, and a good deal of it is just. Yet at the present time we could not do business without the commission man. It would be utterly impossible to move the products of our great country, especially our fruit, without the aid of the commission man. And yet when we put it through that channel we find that the commissions which we have to pay take off a



large per cent of profit from our business; because it is expensive to sell through the commission man. Now if he is an honest commission man he of course is a very great aid to us at the present time, but unfortunately all the men in the business are not honest. The fact is, there are too many men in the business and in order to live, in order to pay their expenses, it is quite the practice among some of them not to return honest sales. I don't know whether I have given you any illustrations or not along these lines, but I had a client whom I was advising here in New England who sent his fruit to the Boston market. He was not receiving for his apples what he supposed he should receive, nor according to the quotations of the Boston market. He was a banker and I had advised him in the purchase of a farm and had laid out for him his general policy for spraying and cultivating his orchards, and indicated to him that the Boston market was one of the best in this country and that if he grew good fruit he certainly would get satisfactory prices for it. I received a letter from this banker saying that he had shipped a large quantity of his apples all through the autumn and into the early winter and was not receiving what he thought he ought to get. His general sales were \$1.50 a barrel when reports for fine fruit ran up to three and four dollars and even four dollars and a half a barrel. I replied to him that if he was positive that his fruit was well put up and carefully graded and shipped in good condition, he certainly should receive more than he was getting, and advised him to put up fifteen or twenty barrels of his best fruit as he had been doing, send it in to the same salesman, send in his own farm foreman and buy the fruit himself and then he would find out what he should receive. He did so, and when his farmer reached the market and the truck drove up with his twelve or fifteen barrels upon it and was unloaded, he stepped up to the sidewalk and began to inquire the price of apples. He saw his own barrels unloaded and opened and examined them critically and said that evidently that was pretty good fruit. He wanted assurance that the fruit ran uniformly through the barrel as it was opened and he was made to understand that the fruit was absolutely packed honestly and could be depended upon. He inquired what would be the price for that lot of apples if he should take the whole of them, and he was

given a price of \$4 a barrel. He paid for the barrels and had them shipped to another part of the city, and two days afterward came back his bill and check for the sale of apples at \$1.50 with 10 per cent commission and freight deducted. Well, being a business man, the banker had no controversy but he made out a bill for all the apples that had been shipped to this firm for \$4.00 a barrel, stating that he had not been satisfied with the prices that had been returned to him, he had bought his own apples, he knew what they had sold for, and he asked for payment for his entire crop—and the check came back by return mail. Now there is a class of commission men in the business that is a curse to the commission business. There are men who will not do that. There are just as honest men and upright men in the commission business as in any other line, but, as I have already said, there are too many men in the business, and they have to live, and it has become a matter of book-keeping, not a matter of sales, with that class of men. They simply will average sales and you get your average no matter what price your fruit sells for. That is one of the difficulties of doing business as an individual today through the commission channels.

Now if you are organized along the lines of a co-operative association or union that thing would not happen, because the manager of your fruit before it went anywhere would know the character of the men who are doing business. He would look up the standing of the commission men. Your fruit would go into the very best channels, you would get the highest value that the market would pay you and you would have returned back to you again the full value for your fruit according to the values of the market. You would be dealing with the best class of men in the commission business and not with the irresponsible speculator who can set up a stand on the street anywhere and if you attempt to find him, can not be found. Many farmers and fruit growers have lost immense sums of money by shipping to irresponsible men who bring discredit and disgrace upon the best class of commission men in the business. So you would be safe in these matters if you would work along the co-operative lines.

Now there is another side to this question, and that is how we can most directly meet the consumer. A very

careful study must be given to this subject of more economical distribution of our products. It costs too much today to get the product from the farm to the consumer, and the consumer is paying altogether too much in proportion to what the producer receives. Here is a very great problem, to know how the system of distribution and sale may be changed and economized. I believe that the prices charged by retailers are too great. I believe that the retail dealers are responsible to a large extent for the present high cost. This again is another side of this question for us to work out. We cannot bring wholesale condemnation against the retailers. There are a great many who are scarcely making a living. But there are too many men in the business again, in the retail trade,—that is one of the problems. In New York City there are today over 14,000 retail grocers, and upon a careful investigation of the standing and character of these men, the facts are known that less than 3000 of them are responsible and can pay their bills and rents. There is so much competition in that line, there are so many retail grocers who are paying high rents and who are selling their goods at a high cost that it interferes with the legitimate business of that great city. They all have to pay their rents, they all have to pay the cost of distribution, and hence those who are in the business as responsible men have this competition to meet, have their trade divided, whereas if they could receive this trade to a large extent the retailers could do more business, reduce their cost, and make more money from their business than they are doing today. Here is one of the big problems in our cities, this question of competition, and those who are in business as retailers running up the very great cost at the present time upon consumers.

There is another side of this question which we will have to study and meet, and that is connected with the consumers themselves in the cities, who are somewhat at fault. Instead of buying in larger quantities—for instance, buying apples by the half bushel or bushel—they buy by the quart. Now let me give you just a few figures if I can recall them. I have had no time whatever to prepare or arrange anything for this discussion and hence I am speaking as the subject presents itself to me this afternoon. I made an examination of some of the bills of some housekeepers in New York several weeks ago and I found

that they were paying for onions, twenty cents a quart, which is at the rate of about \$6.20 a bushel. On that day in the market onions were selling for 75c to \$1 a bushel. That is what the grower received when he shipped onions into New York market the same date. I found in some instances consumers were purchasing apples and paying 25c a quart for them. Now the consumer in buying that way was paying at the rate of \$25 a barrel. On that same date the best apples in New York City were bringing to the producers only \$2.50 and \$3 a barrel. Note the difference between what the producer received and what the consumer was paying on these same dates. The trouble is that the consumers are buying in too limited or small quantities when they ought to buy larger quantities and increase thereby the consumption of these products, which would leave no low priced surplus upon the market.

This whole problem of co-operation is one which we have to take up, and it is one which it is going to take years to develop along the lines that will equalize the cost which the consumer pays with that which the producer receives for his products. It is not a problem that can be settled today or tomorrow. The work must be taken up and studied as a problem. First we must learn to produce more cheaply. We must study methods of economy in production. Then we must take up the question of transportation. I do believe that the day is coming when this country ought to have a postal express. I have not time this afternoon to take up this question, but I do believe that the express companies of our country are standing in the way of the cheaper distribution of many of our products which we ought to have, and hence the postal express, which is coming again before Congress, should receive the support, the study and the intelligent thought of every citizen, who should demand and urge that we have a postal express by which, as they do in Europe, we can get large quantities of products sent by express, and delivered cheaply to the consumer at a very much less cost. The railroads and the trolley lines of portions of Europe are loaded down with the products that are going from European farms direct to the consumers by express, delivered promptly and quickly, at a remarkably small cost. It is important that our carrying facilities be enlarged and the cost cheapened. When we proceed along these lines I believe we shall reap benefit to

ourselves as well as to the consumers who are dependent upon our farms for their products.

Now Mr. President, this is too large a question for me to attempt to pursue longer in discussion. It is one of the most vital that is before us at this time, and will be one of the most important problems of the future. But I believe as the result of such gatherings as this, when you are able to produce such beautiful quality of fruit as you have brought here this year, the getting of this product so much desired in our cities to the city consumer in the fine condition in which we see it here today, and at least cost to the consumer, will be accomplished.



## PRACTICAL DEMONSTRATION - IN PRUNING FOR SETTING, AND TRIMMING TO SHAPE TREES.

By HON. GEO. T. POWELL.

The first tree which I take in my hands is a tree which I want to condemn. I do not believe in what is known as the piece root,—the root grafted tree. I do not like it and you will see the reason why. There is a very small quantity of very fine roots upon that tree. While the tree is well grown otherwise, it is really deficient in roots, and I would rather pay a much higher price for a seedling tree budded than for a piece-rooted tree. But I shall proceed to prune this tree in the way it ought to be pruned, and the object in pruning is to get more roots upon it. It has a deficiency of root and never will make any growth whatever until that root is pruned so as to get a large quantity of roots upon it. When that tree is planted it will begin to throw out a new system of roots at each cut which has been made here. There is stored up in the roots of all trees a material which is all prepared to go out and manufacture new roots. This tree will make a good tree in time, though it will not make a tree equal to a seedling. Just as soon as you make a demand upon the nurserymen of our country to supply you with seedling trees, you will get them, and I would advise you to get them and pay a little more for them because it is a better way of propagating trees, in my judgment. Now I like a low headed tree. I do not like this tree for the reason that there is a crotch in it. The branches come out just opposite and by and by when this gets to be a full grown tree with its system grown out on both sides, the tree will split right down in the center and just when it comes into its value you lose a valuable tree. I would like the head of this tree to be cut down from 20 to 25 inches.

In setting the tree I would set it about two inches lower than the point where it is grafted. I believe in fairly deep setting of trees where the soil has a good open drainage in the subsoil.

Ques. Would it be safe to set the tree as low as that where there is so much snow as we have in this State?

Ans. Well, that is rather a difficult question for me to answer, not having had the experience of deep snow, but my opinion is that by properly pruning these low headed trees, cutting on the lower side as they grow older, you will so strengthen the branches that they will hold up a pretty heavy body of snow. My own experience with low headed trees is that I am getting quite an upright growth. The branch enlarges and continually grows stronger, and I am careful to prune the under side of the branches in order to throw the growth upward and strengthen the growth below.

Ques. How long would you continue to do that heavy pruning?

Ans. I wouldn't prune a tree at all after I had set it out, for five years at least. I would shape the tree as perfectly as I could, and then do no pruning except, if a branch goes in the wrong direction, to slip it out.

I will take now a tree that satisfies me. This is a whole rooted tree; it is a seedling bud. You can see the difference between this and a piece root tree. The piece root tree must have a little time to start and we do not want to be obliged to give our trees time. When we put a tree into the ground we want that tree to forge right ahead, from the time it is planted. The piece root tree must have a little time to re-establish a strong root system from the pruning, while the whole rooted tree goes right ahead.

We will now prune the whole rooted tree. Taking into consideration the top, I should say, cut back the roots of this tree about one-third, right around. Cut every root on the tree. Why? Because even in this system of finely rooted tree you want to get just as much root as you can and every cut you make will cause a new system of roots to be thrown out. In six months time you will be surprised to see what a splendid root system the tree will have.

Ques. How large and how deep a hole would you dig for that tree?

Ans. I would like to have a hole at least 24 inches wide and at least eighteen or twenty inches deep. Have plenty of room

for the roots to spread out and still room beyond that for them to develop for a couple of years.

Ques. Would you loosen up the soil in the bottom of the hole you made for that tree?

Ans. Yes, if the soil is a little bit hard. If it is a close subsoil, I would send the diggers down with a pick as far as they could go with it after digging the hole. It is best in planting a tree to take time and pains.

Ques. Would you advise dynamite for making the holes?

Ans. I haven't had any experience with dynamite. I think it depends on the character of your soil. If you have a subsoil that is of a gravelly loam nature, even if there is a little clay in it, I should not think it would pay to use dynamite. I think you can do it cheaper by hand digging. But if you have a pretty hard, close, tight subsoil, it might then be desirable to use dynamite. I should say it would not pay in such soil as trees ought really to be planted in.

Ques. Would you plant the tree deep enough to cover the bud?

Ans. Yes; I should set that tree down at least two inches. I want to be sure that the tree has roots down where they can get moisture in a dry time. If we set our trees too shallow and have three or four years of continued summer drought, the roots will be injured. I prefer to set them deep, particularly in soils naturally well drained, because then they are safe from drought, if they are down where the roots can go into a porous subsoil.

Ques. Would you dig into a clay subsoil for the sake of setting the tree deep?

Ans. If the clay subsoil is close I should not dare open it very much for the reason that there will be danger of the water settling and not getting away fast enough. When the subsoil is close enough to hold water I would not set the trees quite so deep.

On the next tree, which I have here, one branch is so situated against the side that there is danger of its coming off, and I would take it off now. It seems like taking off a valuable part of the tree, but it is much better to do this now than to have the branch break off fifteen or twenty years from now. This tree is too high headed to suit me, but if you in Maine do not

want low headed trees then I would prune the tree in a manner to save a branch as low down as you can get it. Get the tree started with an open head and let the pruning after this be on the top of it. Do not let it go up into the air so that a thirty or forty feet ladder will be required by and by to pick the fruit. Keep it developing outward, giving it a good spread where the sunshine can get into it. There is not much trouble with sun scald here. Of course in the South the pruning would be exactly opposite, the object being to protect the fruit by growing up a close head and keeping the fruit inside. But here we want our fruit thrown right open to the bright sunshine. Hence, keep the tree open-headed, and keep the top down. Then you can control the brown-tail, the gypsy, the codling moth or the San Jose scale.

The next tree has a little bend in it but that will straighten up and in a few years you will have a beautiful tree, perfectly straight. But this tree has started to be a high header, and that should be stopped right away. First I would take the center right out, and this requires a saw. We have a little saw known as the Diston pruning saw which is very good for such work.—a saw not more than half an inch wide, put on a handle, with a swivel so that you can turn it at any angle you wish. It is the Henry Diston swivel pruning saw, manufactured in Philadelphia. Now proceed to shape up this tree as you want it, cutting every time, if you can, to get the bud on the under side so as to change the growth of the tree outward instead of upward.

Ques. How would you set that tree,—with the bend to the wind or against it?

Ans. I would set it with the bend against the prevailing wind and the wind will help to make it straight. That is an excellent tree with a very good spread in all directions. I care not what the variety is, even if it is a Northern Spy, on my farm I can have it producing fruit at six years of age. Usually at twelve years of age you get a Northern Spy into bearing here in New England. This year I have taken as high as 50 to 55 apples from a seven-year old tree,—beautiful, fine fruit.

Ques. Is any summer pruning done here in the East?

Ans. Not as a general thing. I have done a good deal on my own place and the summer pruning enables me to get the

Northern Spy into bearing much more quickly. If the tree is pruned each year you will keep it growing for twenty years before you get much fruit. Let it fill right out with branches and wood and in a short time the tree will begin to push out fruit spurs, fruit buds will develop, and in a few years you will get a good bearing Northern Spy tree.

DR. TWITCHELL: Here is a three-year-old tree, and we would like to have Mr. Powell shape the top of it.

MR. POWELL: That is a rather hard one to prune. Here are two crotches,—practically three—right together. It is bound to be a bad tree if left as it is, and it is a very difficult tree to get into shape. By taking out two branches I will get rid of two crotches, and then it can be built out in any system you want.

Ques. Do you prune just before setting in the ground or immediately afterwards?

Ans. It depends on circumstances. If we have time enough we prune before we put them out. If we haven't we set the trees and prune them afterwards.

Ques. After they are set out, would you prune any of the growth for four or five years?

Ans. For five years at least I would do no pruning on those trees except to slip out a branch that is going in the wrong direction; simply keep the form which I have started. Let the tree fill right up with wood and when it gets to be seven years of age, cutting with the Diston saw, begin to take out overgrowth here and there. You have got the tree bearing and then is the time to take out your surplus wood, but if you begin now you will keep the tree growing and not bearing fruit.



## FRUIT GROWING, EAST AND WEST.

PROF. F. C. SEARS, Amherst, Mass.

As you probably all know, I have done more or less talking during the past three or four years, on the subject of apple growing in New England. I have told people that there was money to be made out of it, if properly conducted, and have shown my faith in the business by going into it myself. And I have insisted that New England had very distinct advantages over the West. I still think so. But I want to tell you confidentially that for the first week of my stay in the Northwest I was staggered, and began to consider whether the Bay Road Farm (the farm Professor Waugh and I have at Amherst) could be worked over into a poultry farm or a game preserve. For I never saw before and may never see again such beautiful fruit. I had expected to see fine Newtowns and Spitzenburgs, but to see Baldwins and Rhode Island Greenings, absolutely the most beautiful things in the apple line, was rather disconcerting, for I thought they were New England specialties. I said to myself, "My boy, you had better go home and apologize to the orchard men of New England for attempting to lead them astray." This impression of their beautiful fruit stayed with me during my entire trip, and will always stay with me. Their best fruit is a glorious sight and a thing to be proud of, and I take off my hat to the men who grew it. But the longer I stayed there and the more I studied the matter, and in particular the more I got behind the scenes and talked with the growers, the more "comfortable" I felt and the more sure I was that I should not need to offer that apology to the fruit growers of New England.

My second and most vivid and lasting impression was that every man, woman and child of those sections was interested in apples. I never saw anything like it! Not only is the whole county, of such a section as Wenatchee or Hood River, one vast orchard, divided up merely by the roads which run through it, but every business in the county is conducted by and for the

fruit men. The banks are officered by orchard owners. The souvenir cards represent some kind of fruit or some phase of fruit growing,—perhaps two apples taking up the entire space on top of a flat car, or a man hauling a single pear out of his orchard with a team of horses. The hardware stores are full of every contrivance for the benefit of the fruit grower, from cement coated nails for his apple boxes to the latest type of box press. Every orchard section and every railroad has its advertising booklet, ornamented with apples in colors, and even the ladies' hats, instead of looking like a dish pan or a coal hod, as they do with us, looked like a peach basket or an apple box. I can see in this universal interest in the orchard business both an advantage and a disadvantage,—both a hope and a menace. On one hand, it is bound to push the industry forward, it has already done so, and will always do so with any industry, when many men engage in it in a single section. What one man does not think of, another man does, and the business as a whole is wonderfully advanced. On the other hand, if the time comes when this industry fails or is seriously crippled (even for a single year), the whole country is affected, and disaster is almost certain.

My third impression was in regard to their laws. They are certainly sweeping, yet everybody believes in them and supports them. Two examples will serve to illustrate them. At Wenatchee, we were most royally treated by Mr. Mike Horan (a Massachusetts boy, by the way) who is known as the "Apple King of Wenatchee" and who took us all through the valley in his automobile. As we were passing a large orchard, I noticed a big pile of apples, several hundred boxes, piled up near the packing house. They were close to the road and looked perfectly good and I said to Mr. Horan, "Why don't they market those apples?" "Oh," he said, "they are defective ones and we are not allowed to. You could buy that pile of apples, but you couldn't send them outside of the State, the law would not allow it. They can be made into apple butter, vinegar, or champagne, but cannot be sold in a fresh state." Think of that! Fancy what our New England growers would think, and say, if the State should step in and not allow them to market their windfalls and wormy apples! Another day I was talking with a commission man in Seattle about their inspection laws. He told me that they were frequently visited by the state inspectors

who looked through the apples on sale, and if they found a box with codling moth in it, for example, or with any other orchard pest, they would put a mark on the box, and a little later a team would call for that box, it would be taken out to some vacant lot, saturated with kerosene oil, and burned up,—root and branch, codling moth and apples. The owner would not only get nothing for his apples, but he was obliged to pay for the cost of taking them out and burning them! If every package of New England apples in the Boston markets today which contained apples affected with codling moth or railroad worms were taken out and burned, how many do you suppose would be left? I fancy that the cost of good fruit would take such a jump as it never did before. They certainly value the good name of their fruit out there, and this is one reason why it has such a good name. And we might with the greatest profit copy after them, I think. Some of you may remember a talk given by Dean Davenport of Illinois at a recent meeting of the Massachusetts State Board of Agriculture, in which he spoke at length of the Pacific Coast fruit industry. And he gave as a reason for their success that they had learned that two good apples were worth more than the same two good apples with two poor ones thrown in. I often thought of that remark in my wanderings in Oregon and Washington.

My fourth impression was of their climate, and I want to say right here that while we sometimes growl about the weather we get in New England, it is good enough for me! I was in Hood River for most of three days and it rained practically all the time I was there. We took a drive of twenty-five miles through the valley one afternoon in spite of the rain, and we asked the driver whether it always rained there. "Yes," he said, "at this time of the year! It begins about November 1 and rains all the time up to the middle of January, when it stiffens up and we have two weeks of sleighing. Then it begins to rain again and rains nearly all the time up to some time in April, and from that on into May it rains part of the time. Then it stops and doesn't rain any more until the first of November." Just imagine such a climate! Rain all the time until everything is soaking, the roads are gullied, and one hates the sight of clouds! Then sunshine and no rain at all till the dust is as thick as the mud was before, and one would give a month's salary for the sight of a single cloud! It certainly gives color to their fruit.

but I should think that it would also give color to their language!

My fifth impression was in regard to the work of their co-operative unions. It is certainly responsible in a large degree for their success. It is co-operation all along the line,—buying, handling and selling. They establish, in packing, definite grades, as follows:

“EXTRA FANCY—In this grade all apples shall be sound, smooth, free from worms, worm stings, water core, scale, sun damages or diseases of any kind, and of proper shape according to the variety. No apples smaller than 165s shall be allowed in this grade, nor any apples that are of a red variety that are not at least three-fourths red, except that Rome Beauties one-half red will be taken in this grade. Yellow Newtowns, White Winter Pearmain, Grimes Golden, Bellflowers and Winter Bananas will be allowed in this grade, but no other variety of yellow apples. Winter Bananas and Red Cheek Pippin must show a red cheek.”

“FANCY—In this grade also, all apples must be smooth, sound, free from bruises, blemishes, worms, worm stings, water core, sun damages, or diseases of any kind, and of proper shape according to the variety. No apples smaller than 165s shall be allowed in this grade, excepting apples of the following varieties, which will be accepted when packed as small as 200 apples to the box: Winesaps, Jonathans and Missouri Pippins when red all over. All apples of red varieties ranging in color from three-fourths red down to one-third red will be included in this grade. All varieties of yellow apples will be allowed in this grade.”

“GRADE C.—This grade shall be made up of all merchantable apples not included in the Extra Fancy and Fancy grades. These apples must be sound and free from bruises, worm stings, and other diseases. Skin to be unbroken, but will include misshapen apples or apples having a little limb mark or other like defect. This grade will include apples of all colors and as small as 200s, but no smaller. It is optional with the buyer whether this grade is wrapped or not.”

Then they insure that these grades shall be lived up to by putting the packing of the fruit into the hands of entirely disinterested parties. Every packing house is in charge of a boss



packer who is responsible, not to the owners of the fruit, but to the Union. And if the owner objects to the way things are carried on, his redress is through the Union. We all know what this type of marketing has done for them. The Rural New Yorker recently contained a statement from Steinhardt & Kelley, from which I quote the following:

"Our contract with the Hood River Apple Growers' Union, as represented by their board of directors, is certainly a very stringent one, they guaranteeing us a perfect pack and also guaranteeing that every apple in every box is absolutely perfect. We have handled several hundred thousand boxes, and never have we found ourselves in condition to make a single complaint against their pack. It is as near perfect as human ingenuity and honesty of endeavor can make it; in fact, we shall be glad to have you drop into our place of business at any time and take a box of fruit from the heap, and you will find that every box is practically identical, and that every apple is absolutely perfect, whether you open the top, bottom or side of any package. This is more than we have been able to say for any other large pack of fruit that we have ever contracted for."

In order that the packing may be satisfactory, the Union is very careful who does it. No one is allowed to pack who does not have a license from the Union, and only those who have proved that they are capable will be granted such a license. In order to keep up the supply of good packers, they conduct each fall, at the beginning of the packing season, a "packing school," where every one may get two weeks of practice under expert supervision for \$15. At the end of that time, any one of ordinary ability should be reasonably expert. If the "graduate" from this school packs for members of the Union during the whole season, he gets a refund of his \$15 at the end of the season. Isn't this packing school something which we ought to take up, whether we adopt the box or continue to pack our apples in barrels?

I should like to continue this discussion of general impressions, because there are several other matters which interest me greatly, but I must pass on to the second section of my subject, viz., a comparison of New England and the Pacific Coast.

Some three years ago, at the request of Mr. J. Lewis Ellsworth, Secretary of the State Board of Agriculture of Massachusetts, I wrote a bulletin which was called "Western Methods in New England Orchards," giving my notions as to the reasons



for western success in orcharding and as to the comparative advantages of the East and the West as apple growing sections. This of course was without any first hand knowledge as to the West. I was greatly interested, therefore, to "check up," in this recent trip of mine, the impressions I had received from reading and talking with others, and from observation of the western fruit in our eastern markets. And it was a source of considerable satisfaction to find that my long-range impressions were generally sustained on closer examination. I want now to record my notions on this point, both because many are still looking to the West as the only (or at least the best) place to grow apples, and because those of us who are taking up the fruit business here in New England need every encouragement to keep us "strong in the faith."

I believe that the following is a fair, and I hope impartial presentation of the case of the western apple sections. Their advantages as I see them are:

(1) That they can and do, as I have said, produce fruit of the very greatest beauty, more handsome than we produce in the East. I know some of you will want to object to that, and I know that some of our finest fruit leaves little to be desired from the standpoint of beauty, but I, for one, am willing to admit that as a class western fruit is prettier to look at than eastern. I certainly never saw anything quite so handsome as some of the Baldwins, Rhode Island Greenings, York, Rome Beauties, etc., which I saw on exhibition at Vancouver and Spokane last year. And since looks will always be an important item in selling fruit, we must concede that the western growers, as a class, have a distinct advantage there.

(2) Their trees bear earlier, I should say from two to three years earlier on the average. This, I think, is principally due to their very long season, which really allows the tree to do the same amount of growing, to reach the same amount of maturity, say in four years that our eastern trees reach in six. Take the following examples:

"The Olds Company, Burch Flat, Wenatchee, Washington, have fifteen acres of King David Trees four years old, which will average one box per tree;" or this, "H. S. Wetherald, Wenatchee, has ten acres of six year trees which will give 3500 boxes, or between five and six boxes per tree;" or this, "N. D.

Heath, Wenatchee, has 85 Jonathan trees, seven years old, which will average six boxes, while 85 Black Twigs will go ten boxes." Imagine seven-year old Baldwins in Massachusetts giving over three barrels per tree.

(3) Their trees bear more heavily and more regularly. I am not quite sure how much of this may be due to their better care, particularly in thinning, but I believe that it is in some part at least due to their long season, as referred to in the last paragraph, which allows the manufacturing plant of the tree to mature a big crop of fruit and still have enough surplus plant food to develop a fine set of fruit buds for the following year. In support of this general contention that their trees bear more, take the following: "Jack Lillis picked 2400 boxes from 143 Rome Beauty trees, besides 200 boxes on the ground. These trees occupy one and one-half acres of land, and the fruit will sell for \$3000. Last year this acre and a half produced 1000 boxes which sold for \$1860;" or take this, "Sterling Brothers, Wenatchee, will pick 3000 boxes from 504 trees nine years old. Last year the same trees gave 3000 boxes and the year before they gave a net return of \$3000."

(4) There is a more general interest in the industry. I have already discussed this under my general impressions, but want to restate it here, as I believe it is a great factor in their success. I do not know how far it is possible or desirable to bring this about in New England, but it seems to me that such very promising sections as Colrain and Ashfield, in Massachusetts, for example, might profitably develop the orchard business till they could have warehouses and all the conveniences which go with a well developed industry.

(5) They have fewer pests than we have. This of course will tend to change as the orchard business develops; in fact, many pests are already noticeably on the increase. But with their vigorous treatment of these pests and with the dry growing season, which is so unfavorable to fungous growths, I do not believe they will ever have the same trouble from the ordinary, orthodox orchard pests that we do.

(6) Their virgin soils are better supplied with all the constituents needed by the tree for the production of choice fruits. This of course would not apply to orchards started on new lands

here, but the great bulk of our orchards are not put on such land, but on fields which have been long in cultivation.

The other factors which certainly contribute to the present lead of the western grower—but which we must pass by with a mere mention are:

(7) Their better laws, already discussed, and which I doubt if we are ever able to duplicate here because of lack of popular support.

(8) The tremendous development of co-operation, another thing which I fear we can never hope to duplicate here, or at least not for many years.

(9) The fact that their trees are all young, and are consequently bearing their very best fruit at the present time. This of course will "mend itself."

Turning now to the eastern side of the question, I am going to merely state what it seems to me are our advantages, because I have spoken of them so often before.

As I look at the situation our advantages are as follows:

(1) That we are close to our markets. I was told in Hood River that it cost them 89 cents a hundred to get their fruit to Chicago, and \$1.00 to get it to New York. Two boxes are accepted by the railroads as the equivalent to 100 pounds. Mr. M. H. Shepard, the editor of "Better Fruit" says in the December number that it costs about 50 cents a box to grow the fruit. This makes \$1 per box or nearly \$3 per barrel which it costs them to land their fruit in New York or Boston. Certainly our New England orchardists can make money, and good money, at \$3 per barrel in Boston, so that we are in a position to make orcharding pay, and pay well, on a price that would just cover expenses for the western grower.

(2) That our apples are better in quality than the western apples. Of course the westerners won't admit this, and even some easterners doubt it, but I cannot believe that the impression would be so general among consumers if it were not backed up by fact. I am not prepared to say that the western apple is not as good as the eastern apple when it is picked. Perhaps it is. Perhaps the long journey affects the quality. But I do believe that you would not find so many complaints of the lack of flavor in the western apples if there were not something in the charge. And I believe that the better prices the past two

years of the barrel fruit and the lower price of the box fruit means simply that the consumer is coming to realize that he gets quality here.

Now if I were pleading this case as a lawyer before a jury, I should be perfectly willing to rest my claim on these two points. If we can grow fruit of better quality and can market it at a good profit at prices which will only bring the western man out whole, what more do you want, if you are going into orcharding at all, to convince you that New England is the right place?

But there are certainly other advantages for the East. To keep up the scheme of numbering, these are:

(3) That land is cheaper with us, much cheaper. Good land can be bought for \$25 an acre, or even less.

(4) It is easier to get labor. I cannot see how such isolated fruit valleys as Wenatchee are going to escape trouble on the labor problem.

(5) We have a better market for our poorer grades. I know we don't market them in the right way, and I know we have too many of this grade; and I know that our western friends, if I were to make that statement, would laugh at it, and say we were welcome to that advantage. But when I think of that big pile of beautiful apples which my friend Mike Horan **showed me**, I can't help feeling that a good market for it, if it were marketed in the right way, would be a valuable asset.

(6) We have better markets for our perishable fruit like berries and plums and peaches. Of course they do ship plums and even strawberries to eastern markets, but they are certainly handicapped more with these than with apples and pears.

In closing this list of our advantages, I want to mention two difficulties which it seems to me they face, and which cannot help acting as a drawback to the industry there, and consequently as a help to the eastern grower in the keener competition to which we must look forward. In the first place, I am sure that irrigation is going to bring increasing difficulties in its train. I believe this is one reason for the milder, poorer quality of the western apple. In the second place, their trees are planted very close together, and will soon need thinning. And beyond doubt many growers will not thin as soon as they

should, with the result that the quality of the fruit will be lowered.

And lastly, it seems to me that these well established sections are at the present time at the very height of their prosperity. Their orchards are young, giving the very best returns. I was told by the president of the Oregon State Board of Horticulture, a very enlightened man and a very fair minded man, that he considered they were now getting the cream off of their orchards, that he didn't see how it could be otherwise,—and I certainly do not. I asked him his opinion as to the relative advantages of the East and the West and whether if he were a young man here in the East he would go West to grow fruit. He said, "No, I consider there are just as good chances along the Connecticut River as here and if I were a young fellow in the East going into orcharding, I should certainly stick to New England."

Now, ladies and gentlemen, these are the points which I wished to bring out and it certainly seems to me, as I said in the beginning, that while there are many things that we may profitably learn from the westerner, we do not really need to be afraid of the western competition if we will take hold and grow such fruit as you people have here, and put it up in the way that the best of this fruit is put up; and I want to close by expressing my admiration for the exhibit of fruit you have here.



## AN HOUR IN WONDERLAND.

MRS. V. P. DECOSTER, Buckfield, Maine.

When I was a small child I learned to believe in fairies and I still believe in them more and more. People may tell you that there are no such things as fairies, but you will find that I am telling you the truth, if you will go quietly to the fields and woods, brooks and pastures, and watch and listen patiently. But if you go whizzing through the country in an automobile or an electric car, you will never become acquainted with the fairies. They can be found on nearly every farm and in every forest in the State of Maine. They may not look just as some fairy books picture them, but they are just the nicest kinds of fairies imaginable, when you get acquainted with them.

A few weeks ago I discovered the headquarters of the fairies in our town. It was in a beautiful hemlock grove where the trees ran up tall and straight, and the ground was free from underbrush, carpeted with evergreen needles, and outlined in beautiful patterns with ferns, gold thread and partridge vines dotted with red berries. Away up in the tree tops an old grey squirrel keeps guard and warns the fairies of all intruders. The fairies had held a grand carnival the night before, for there were many tables and dancing pavilions, which looked like mushrooms. Some were round and smooth and flat, some of shades of pink and others of yellow and orange and brown. Some were shaped like open umbrellas, others were inverted, and others almost round. Many people eat mushrooms, but these which belong to the fairies in the woods are very likely to be poisonous, and it is never safe to eat even those gathered in the open pastures unless collected by an expert.

In this grove the fairies keep their pipes, which are often called Indian pipes, but I think they are fairies' pipes, because they are so pink and white and waxy.

Here also grows the coral root, with dainty orchid flowers and yellow jointed roots, from which the fairies make coral

necklaces. 'Along one edge of the grove dances a laughing brook. The banks are fringed with beautiful ferns while great trees lean over the water. There is one deep pool beside a huge boulder where the speckled trout and water babies live. On the edge of the brook grows the purple fringed orchis.

Farther down in the woods, the brook rushes over some great rocks, under which the larvae of the Dobson fly live. Fishermen call them hellgramites, and use them for bait when fishing for bass. The hobgoblins are ugly looking fellows, growing to be three inches or more in length, with a row of legs and gills on each side of the body. When fully grown they crawl into the bank, and in about a month come forth a large winged insect with a wing expanse of four or five inches. The males have fierce looking mandibles which strike fear to the hearts of small fairies.

On still pools in the brook are black water striders, looking like long legged spiders. These skim about over the water, occasionally jumping into the air to catch some small insect.

Where the brook enters the meadow are many beautiful flowers. Here the fairies get their foot-wear from the early pink ladies' slipper. A little later blooms the yellow moccasin flower, and the last of June, the great showy ladies' slipper.

In the grasses grow the dainty orchids, called ladies' tresses, which look like fairies' curling locks. Here, too, are the wonderful pitcher plants. I have brought you some of the leaves so that some of you teachers or scholars can take them to school tomorrow to show to those who are not here tonight.

Along the edge of the woods grow the early hepaticas from which the fairies get their white fur hoods. Here, too, are the may flowers, spring-beauties, trillium, ground-nuts, yellow violets and Dutchmen's breeches. Though why the flower books should give such pretty flowers such ugly names, I cannot understand. They might as well be called fairies' bloomers.

The thick white flowers of the turtle head grow along the brook and the leaves furnish food for the larvae of that rare and beautiful Baltimore butterfly. Fairies are evidently fond of kitties, for they have many pussy willows and alder catkins. Occasionally one sees a dainty, light green, lacy winged insect, called golden-eyes. These are very useful fairies, as their larvae destroy plant lice. They fasten their tiny green eggs

on the top of stiff white hairs, nearly half an inch tall. I have seen them on all sorts of things, such as apples, cucumbers, and cabbages, and once on a screen door.

Just as soon as the ice is melted in the brooks and marshes the fairies start their band concerts. First are the pipers or Pickering tree frogs, then the deeper bass of the bull frogs, and in the soft, warm nights of May, the love songs of the toads. It hardly seems possible, that so ugly looking a fairy could have so sweet a voice. Yet Hamilton Gibson in "Sharp Eyes," says, "It is to me the sweetest sound in Nature." Those warm moonlight nights, ushered in at sunset by the songs of the hermit thrush and veery, followed by the sweet thrilling love songs of the toads and the plaintive call of the whippoorwill, are the pleasantest nights of the year. I listen and listen and fight away sleep as long as I can.

For a few days the last of June, if one is near a lake he will sometimes see about sunset clouds of may-flies in the air. These are delicate greenish-yellow insects, with a wing expanse of nearly two inches, and two or three long thread-like organs from the end of the body. Their first life stage is in the water where they crawl about in the mud as little black creatures, with a row of legs and gills on both sides of the body. From these, hatch these beautiful winged fairies, which only live long enough to mate and drop their eggs back into the water for another generation. Last June I saw them at Wayne pond flying in clouds like great snow flakes, while the beach was lined with the empty skins of the nymphs. The dragon-fly or devil's darning needle has a similar life history. When I was a child I used to believe that they would sew up my mouth if I told a lie. That is why I grew up so truthful, and now feel obliged to tell the children that they are not only harmless, but are one of the good fairies, as they live chiefly on mosquitoes and other small insects.

The white faced hornets are good fairies also, for they live on flies, slugs, and many other injurious insects, so boys should be taught that when they burn a hornets' nest, they are injuring good friends.

Bumble-bees which live in the deserted nests of field mice, are of great value in fertilizing flowers. They are the only bees which have a tongue long enough to reach into the honey

tubes of the red clover. Some years ago, I knew of two little brothers who got some honey out of a bumble bees' nest. The older boy cautioned the little one not to go there alone. But a day or two later, the little boy's desire for honey made him disregard the caution, and he came to the house crying bitterly, and told his mother,—“I went down to the bumble bees' nest to get some honey, but the old bee was on.”

There are many kinds of bees but none so valuable as the honey bee. People generally think only of the honey which the bees gather for us. But if the bees were destroyed we should lose nearly all of our apples, plums, pears, cherries and small fruits, besides melons, squashes, cucumbers and three-fourths of our flowers.

Farmers who wish to raise fruit should not depend wholly on wild bees. Mr. DeCoster tried an experiment one year by enclosing one branch of an apple tree in netting just before blossoming. Although that branch bloomed just as freely as the rest, it bore scarcely any fruit, while the rest of the tree was loaded. What few apples grew on that branch must have been fertilized by the wind. The wind carries the pollen for such blossoms as the catkins of the alders and poplars and for the cone bearing trees as well as many of the deciduous trees. By the way, do you know how interesting our trees can be in winter? A few winters ago I sent here to Augusta for Edgar E. Ring's little booklet on the “Forest Trees of Maine.” It is very interesting to learn the kinds of buds and bark and arrangement of branches. It makes the trees fully as interesting as in summer; and at the same time gives you a chance to study the winter birds and animals. I know many of you orchardists can tell the variety of apple trees in winter, by the size and manner of growth of the branches, buds and bark.

Life in the country is beautiful to the Nature lover at any season of the year. If our boys and girls once learn to love these little fairies in our wonderland, and can realize the power man has to utilize the mighty forces of Nature in getting a living from the soil, we should not need to ask how to keep them on the farm.

Now I have brought a few things here which I wish the children especially to see. I see you all know Robin Red-

breast as soon as you see him. Of course Robin is one of our best fairies.

Here is one of our common winter birds, the Snow Bunting. You will see these in flocks round on the weeds. That is one of our fairies.

But here is one of the hobgoblins, a pretty bird, but he is one of the enemies of the other birds. This is called the shrike or butcher bird. This is one of our winter birds also, but he is a very cruel bird. He has a cruel, ugly bill like the hawk, and lives on small animals and insects. He kills a great many large grasshoppers as well as field mice, and other little birds. You people who live in the country have probably seen quite often mice hung up on trees. Sometimes they are hung in the crotches of branches with their head caught in the crotch, and no doubt you have wondered how a mouse could ever get up into a tree. Well, it is the work of the shrike or butcher bird. He will kill a great many more mice and little birds than he can eat and uses the trees for cold storage plants and hangs them up around till he gets ready to eat them. Sometimes he eats them, sometimes he doesn't.

Here is one of the dearest birds that we have. It is not a very common bird but it is an especially pretty one and one of our sweetest singers. This is the Rose-breasted Grosbeak, a very sweet singer. It resembles the oriole. They are not nearly as plently as I wish they were.

This is one of our dear little winter birds, the Chickadee. Nearly everybody knows the Black-capped Chickadee, which has such a cheerful little cheep in the winter. You all know the notes chickadee-dee-dee, but not every one knows that it also has two other songs. It has one sweet little call of two notes which very much resembles the song of the Phoebe, only a little fainter and sweeter.

Now we have one of our most cheerful spring birds. I think most of you can see the red and yellow epaulette on its shoulder,—the Red-winged Blackbird. A peculiarity about these birds is that the male birds come first; although they are very devoted husbands after they are once married and never flirt with any other women, yet they come ahead and leave the girls to tag along behind. They live, after they decide where to build, in wet places along the brooks and ponds, but when they first



come they seem to hold conventions on higher land. The most of their notes are harsh, but if you can get near one of those conventions, once in a while you will hear one of the most liquid, sweetest notes there is in the bird world.

Now here is a bird which I hardly know whether to call a fairy or a hobgoblin,—the bluejay. You know we have this bird the year round. Well, the bluejay is generally considered a hobgoblin. People say that he is very cruel and that he kills other little birds, but those who have studied him the most say that he is a good friend to us because he eats a great many of the injurious insects. A few years ago I was having a lesson on birds with a little nature class and I told the boys to find out what they could before the next lesson about the bluejay, and one boy told me that there were some bluejays in his father's orchard and his father said that they were eating buds from the apple trees and told him to take his gun and go out and shoot the jays. Well, he took the gun and went out there, but he sat down to study the bird and get near to it—that was several years ago when we had a great many tent caterpillars—and he found the bird was twisting off the eggs of the tent caterpillar laid in clusters on the little branches. The bluejay was making a good square dinner out of the tent caterpillars' eggs, and he didn't shoot the bird.

The next is one of our best friends, a bird with a very long tail, the Black-billed Cuckoo. This is one of the birds that will eat a hairy caterpillar. There are not many that will. The most of them will eat the big, juicy fat ones, but this will eat all kinds, even the tent caterpillar. Last year I found a nest of one in an apple tree, very near one of my cages where I keep some of my choicest caterpillars. Well, I loved the bird and I loved the caterpillars and so I didn't know what to do. I climbed up and looked into the nest but I didn't hurt the bird, but she resented that so much that she changed her nest, just because I had looked at it. I thought it was very unkind in her, but still I didn't feel very bad to think she went somewhere else.

This is not a very common bird in Maine. I am told it is quite common in Connecticut. But once in a while we see it, as it migrates through here. It is the Scarlet Tanager, with bright wings and tail and a bright red body. I suppose, being so

bright, it is a target for boys with guns who don't realize that they are shooting one of their best friends.

Here is a little tiny bird, which is one of the birds I love the most,—the Chestnut-sided Warbler. Like some women it is always happy and cheerful, darting around and doing the hard work. It really has very pretty colors, chestnut and yellow and black, and it has a very sweet song.

Now here is a bird that all the boys and girls near enough to see the colors will say is a bluebird. It certainly is a very pretty blue bird, but it is not what we call the bluebird. Our real home bluebird that comes near the buildings and builds in the old apple trees has a reddish breast. This is bright blue all over. We call this the Indigo bird. It is rather a shy bird and is not seen very often, but when you do see it, it is flying along through the bushes out of sight of the road, and the male at mating season has a very sweet song.

I have now a peculiar bird, that is, in some ways. Any one who knows the thrush family will see the thrush streaks on its breast and the crown of its head. It is called the Golden-crowned Thrush, sometimes the teacher bird. The male bird has a beautiful song that very few people know, but you generally hear it by the notes of "teacher." It begins very low and keeps going a little higher each time. It builds its nest in the woods in the dry leaves. Sometimes you see the leaves in a little mound as though some plant were growing up and pushing the leaves. You find a little hole in one side—they say it is the shape of a dutch oven, and inside is the cosy little nest of the teacher bird.

Next is one of our home birds, the red-eyed vireo. It is not very common. It is known by its slate-colored cap and the olive colored back and light breast.

Now comes one of our tiniest little winter birds, almost as small as the Home bird, with a bright yellow cap, edged with black. This is a winter bird and the colder it is the happier this little bird seems to be. It isn't still a minute, when you see it it is darting around among the trees. This is called the Golden-crowned Kinglet.

This is one of our common friends, although he does not look natural a bit. When you see him he is generally just

sailing over the trees with his wings spread out, singing bobolink as sweet as can be.

Here is what we call the Purple Finch, sometimes the Red Linnet. It is a very sweet singer.

Here is another bird of almost exactly the same colors and the same shaped bill. This is a Canadian bird that we have with us along in the winter, and very many people will tell you most confidently that they saw a flock of robins yesterday. You will say it couldn't have been. But I have heard people stick to it that they saw robins because they caught a glimpse of these red birds. Only the males have this red color, but they are also red on the back. It is a sort of a strawberry or raspberry red. And you see the bird is almost as large as the robin, although it has a shorter, thicker bill. This is called the Pine Grosbeak. One peculiarity about it, is that you will seldom see more than one male in a flock and sometimes not that, and the females are all dull slate color. The females are very tame and not very attractive looking birds. They eat a great many different kinds of buds in the winter, especially, as the name would imply, among the pine seeds and cones. I have seen them come within a few feet of the house into the maple trees and in an orchard where there are frozen apples hanging on the limbs they will pick the apples open to get at the seeds.

Now these are only just a few of our commonest fairies. I have here fairies of another kind. A great many of you people have read Mrs. Gene Stratton Porter's book, "The Girl of the Limberlost," and in that she has made the Yellow Emperor famous. This is the Yellow Emperor that she speaks of. The young lady had a dress made like it to wear to a ball and as the ball began, through an open window one of these great moths fluttered in, so that the people could see the resemblance between the moth and the dress. All the moths are not as large as that. This came from St. Louis, but they are raised even as far north as Portland, and Professor Hitchings says he has raised them in Massachusetts.

Here are some of our commonest fairies that are with us every night every spring, more or less, after the middle of May through June in warm evenings. The Cecropia moth is very common and yet there are very few people who see it.

You probably see it fluttering around at dusk. This is made up in what we call a life history. I wish we could have these life histories in every school in the State. Children are so interested if they see anything of this sort, to hear the name. Now those people who have read "Freckles" by the same author as the Girl of the Limberlost—Freckles was a boy and that was a nickname for him—remember where she tells about Freckles seeing the Luna moth hatch. He watched that moth come out of the cocoon and he was consumed with a desire to know what that wonderful thing was. He could not express his feelings, because he wanted to know what it was, what the name of it was, how long it would live, and what it would amount to. And children as a rule have that same feeling about these things. If they see them once they want to know the name. Now children will often bring in caterpillars to their parents. Ninety-nine women out of a hundred, and men too, are afraid of caterpillars, and if a child brings one in they tell him to carry that ugly thing out and kill it. They think everything that is a caterpillar is dangerous, whereas there are only two kinds of caterpillars in this State that are dangerous. I guess you all know the brown-tail by this time, you know it is dangerous, and yet I don't believe that half of the people who clean the caterpillars off of their trees can pick out a brown-tail caterpillar if it is put in with a lot of other hairy ones. You know it is brown-haired but very few people can tell just what it is. Here is a life history of the Cecropia moth; the eggs on a branch, the caterpillar into which the egg grows, the cocoon which the caterpillar spins when it gets its full growth and stays in through the winter. Now these cocoons are very common. Here are some just as they are found on branches. Well, half of the people that fight those think they are brown-tail moth nests, and yet when you come to really look at them you can see there is a great difference. These caterpillars spin their cocoons onto the branches and they hang there all winter. Any one finding one of those, if he picks it and takes it into the house will see beautiful moths hatch in the spring. I presume thousands are burned up every year. I brought quite a number of these here that I would like to give to the teachers if there are any that would like to have them, at the end of the meeting, and also a few of the luna cocoons.



Here is the life history of the luna. This is one of our commonest moths and to me it is the most beautiful, it is so dainty. Just taking these luna cocoons in my hand has disturbed the pupae and they are rolling over and over and over inside. It is very interesting to watch them hatch. The cocoons do not hang onto the branch like the *Cecropia*, but the caterpillar when it gets its growth comes down under the trees and spins the cocoon down among the dry leaves and grass. And it has a peculiar way of getting out. I have read a great many things about the luna and I have watched a great many of them hatch but I never learned until this year how they got out. The silk is very tough and we wondered how they got out of that silk until one day this summer one of the girls said "I am going to find out how that luna gets out of its cocoon," and she held it in her hands and watched it closely. As the hole began to show and it stuck out its antennæ and got out she found on the shoulders as we would call it, right where the wings join the body, two little tiny hooks as sharp as needles and not more than an eighth of an inch long, and as he kept working his shoulders these little hooks kept tearing the silk threads, and that was the noise we heard. He tore these little silken threads till he got the hole big enough to come out. But he had not been out five minutes when you could not see the hooks. As the down dried out and fluffed over his body it covered those, and I suppose that is the reason we never saw them, because they only showed when the moth was wet.

Here is the *polyphemus*, the brown one, very common among us, as common as the others, and the caterpillar looks so much like the luna that you have some difficulty in telling them apart unless you look at the head. The *polyphemus* has a brown head and the luna a green one. The cocoon of the *polyphemus* is white and that of the luna is green. These moths are very easy to raise. If you can get a female that has not laid her eggs and can keep the eggs, you can raise the caterpillars very easily. I have raised as many as two thousand lunas in one year by pasturing them out as Proessor Hitchings told me to do. Instead of keeping them in cages at the house and feeding them on leaves, you can make cages of surgeon's gauze or cheese cloth as we call it. We sometimes take mosquito netting, and make large bags. Tie the bag right over the end of a



branch of the food plant of the caterpillars. The lunas feed almost entirely on gray birches, the polyphemus and cecropias also feed on those but they will feed on others—the cecropias will feed on almost any kind of a fruit tree. Then put these little caterpillars or the eggs in there and let them feed on those leaves until the leaves are nearly all eaten; then you can transfer them to some other branch. It takes them only about six weeks to grow, so that you can raise a great many in a short time. There is one very interesting way to catch the male moths. If you can find a cocoon and hatch a female moth, then put her in a wire cage and set it near an open window, and leave the window open all night if you don't want to sit up all night and watch them. We tried it one night with the polyphemus. I read in a book somewhere of a man that caught twenty-seven in one night and I thought that was an almost improbable story. But two years ago we tried that one night and we had sixty-five the next morning, by actual count, of these great moths all over the room. And about that same time in one night we caught twenty-four of the lunas. I don't want you to think we killed them all by wholesale because we only saved a few of the best and let the rest go.

Here is an arrangement that we call a nature picture,—insects arranged with grasses and flowers so as to make it look a little more natural as if they were flying around. A good many people keep their insects on pins but somehow there is a rather unpleasant feeling about that. Sometimes we make them up in large pictures in a common picture frame, perhaps a yard square. You can make beautiful pictures that way and make them look quite natural. If we could only have the life histories of these common insects especially, in our rural schools, so the children could learn these, it would be of the greatest value. Now children will hear you tell about these brown-tails and about their being poisonous, but they don't know about them. At our Pomological meeting at Waterville, I think, two or three years ago, I was talking with the school children there and one little girl told me that some one told her if a brown-tail moth bit her she would die and that girl was living in daily fear. She didn't know what a brown-tail was, and didn't know that a moth couldn't bite any way, and there she was living in fear that if that moth bit her she would die.

They ought to be told things a little plainer, and some of our men ought to be told too. If the brown-tails are as thick all over the State as they are in Oxford County, I pity you Augusta people who have got to clean these trees this winter, for if they are not cleaned how are you to live next summer.

I think I have shown you all you can see here in the evening. If we can only awaken a little interest among the children—and grown people too—if we can only get an object that will give us something to think about we won't grow so narrow-minded. Men and women ought to find some kind of interest beyond their work, something that will be a rest to them outside their work. I expect people think I am a crank and pity my poor husband because I carry it so far, but somebody has got to interest the others. And when you do get interested in nature it opens such a broad field. If our boys and girls can get interested in these things and get some faint idea of the wonderful possibilities of earning a living out of the soil and of raising such fruit as this we won't have to ask how to keep them on the farm.

ANNUAL BUSINESS MEETING, THURSDAY MORN-  
ING, NOV. 16, 1911.

Meeting called to order by President Twitchell. E. L. White gave his report as Secretary as follows:

During the year there have been three meetings of the Executive Committee held.

The first was in Auburn January ninth. The premium list was revised and other business relating to the year's work was transacted.

The second meeting was held in Augusta February eighth. Matters that were before the Legislature were discussed and acted upon.

The third meeting was held in Greene August twenty-third at the home of Vice President H. L. Keyser. The program and other matters relative to the annual meeting were discussed.

One field meeting has been held during the year. Mr. H. L. Keyser invited the Society to meet with him on August twenty-third. A large number gathered to see the practical side of raising fruit. His orchards gave a number of different lessons in cultivation and spraying. The meeting was considered a fine success.

During the year a Federation of Agricultural Societies has been formed. Our Society is entitled to representation according to our membership. Our Society has been represented at the meetings held by the Federation.

The membership of the Pomological Society now numbers a little over two hundred. The list of life members has been revised during the year.

It was my pleasure in February to be present at the winter meeting of the Connecticut Pomological Society. The fruit display was a good one for the time of year but my attention was especially attracted to the large list of annual members. It was secured by the efforts of a committee assisted by each member of the Society. There were, I think, five hundred

members. Such a large membership scattered over the State must be an incentive to increased interest in the work of the Society.

The interest in fruit growing in our State is certainly on the increase as the Reports of the Society have been in greater demand than last year and could our membership be doubled the good work being done by our Society in the interest of fruit growing and marketing would become better understood and more appreciated.

Respectfully submitted,

E. L. WHITE.

Voted, that this report be accepted and placed on file.

The report of the treasurer, Mr. E. L. Lincoln, was then presented as follows:

## REPORT OF TREASURER.

Ellis L. Lincoln, Treasurer, in account with the Maine State Pomological Society for the year 1911.

### RECEIPTS.

Cash on hand from the year 1910 .....	\$176 49
January 1, interest on Stock First National Bank, Farmington .....	12 00
January 1, interest on Bonds, First Mortgage .....	22 50
July 1, interest on Stock First National Bank.....	12 00
July 1, interest on Bonds, First Mortgage .....	22 50
February 9, received from State balance on Stipend for year 1910 .....	74 27
December 2, received from Savings Bank, interest.....	41 46
December 2, received from Secretary for space in hall.....	10 00
December 2, Life Membership fee, 1911 .....	70 00
December 2, Annual Membership fee, 1911 .....	54 00
January 22, received from State Stipend for year 1911.....	764 30
February 15, 1912, received balance of State Stipend for year 1911 .....	235 70
Total Receipts .....	\$1,495 22

## EXPENDITURES.

February 21, Paid Will E. Leland .....	\$11 00
March 6, Transfer to Permanent Fund .....	120 00
June 12, Paid Knowlton & McLeary Co. ....	5 00
September 7, Paid E. F. Mason .....	1 50
Maine State Bookbinding Co. ....	28 75
W. E. Leland .....	5 20
G. M. Twitchell .....	5 00
E. F. Hitchings .....	5 12
Maine Farmer .....	3 50
December 4, Paid Loring, Short & Harmon .....	2 05
Brunswick Publishing Company .....	2 50
G. A. Drew .....	33 80
George T. Powell .....	63 60
F. C. Sears .....	48 62
H. F. Hall .....	35 90
J. B. Castner .....	21 60
M. C. R. R. Freight .....	2 40
A. A. Marshall .....	2 28
Maine Farmer Publishing Company.....	3 75
Board of Trade Journal .....	4 00
Burleigh & Flynt .....	33 60
Premiums .....	380 50
Augusta House .....	87 80
December 4, Paid E. L. Lincoln .....	4 50
E. L. Lincoln .....	5 00
E. L. Lincoln .....	25 00
G. M. Twitchell .....	5 95
C. F. Fletcher .....	18 64
E. L. White .....	150 00
E. L. White .....	46 33
December 30, Paid Mrs. Eva M. Black .....	3 00
E. F. Hitchings .....	3 20
Burleigh & Flynt .....	14 30
M. C. R. R. Freight .....	2 52
Mrs. V. P. DeCoster .....	15 00
John C. Woodrow .....	3 75
F. H. Morse .....	5 35
F. H. Morse .....	12 46
Transfer to Permanent Fund .....	70 00
Error in premium .....	1 50
Swift & Turner Company .....	2 10
W. V. Hunt & Company .....	7 50
L. B. Raynes .....	53 45
E. L. White .....	4 89
W. W. Bonns .....	1 10
<hr/>	
Total Expenditures .....	\$1,363 01
Cash on hand .....	132 21
<hr/>	

\$1,495 22



## PERMANENT FUND FOR THE YEAR 1911.

December 30, By members as reported for the year 1910....	\$1,910 00
Fees received for the year 1911 .....	70 00
	<hr/>
	\$1,980 00

## PERMANENT FUND INVESTED AS FOLLOWS.

Four shares stock First National Bank, Farmington.....	\$400 00
Two bonds Stockton Springs Water Co., First Mortgage....	970 00
Deposit in Savings Banks .....	610 00
	<hr/>
	\$1,980 00

Respectfully submitted,

ELLIS L. LINCOLN, *Treasurer.*

Voted, that this report be accepted and placed on file.

The president then appointed Dr. J. W. Bowers, Mr. J. W. True and Mr. T. M. Lombard a committee to receive, sort and count votes, and the following officers were elected for the ensuing year: President, Howard L. Keyser, Greene; first vice president, W. H. Conant, Buckfield; second vice president, A. K. Gardner, Augusta; secretary, Edward L. White, Bowdoinham; treasurer, E. L. Lincoln, Wayne; member of executive committee for three years, F. H. Morse, Waterford; member of Experiment Station Council, R. H. Gardiner, Gardiner; representative to New England Fruit Show, Homer N. Chase, Auburn.

Voted, that the election of the trustees be left with the incoming executive committee.

Voted, that the invitation from the Board of Trade and Mayor of Portland be referred to the executive committee.

Voted, that the Society extend an invitation to the New England Fruit Show to meet with us at our next annual meeting.

The committee on resolutions reported as follows:

*Resolved*, That the members of the Maine State Pomological Society hereby extend to the Augusta Board of Trade their sincere thanks for the cordial invitation to hold our annual meeting in the city of Augusta. We also recognize, with thanks, the efficient service rendered by its special committee in working up an interest in the meeting and exhibition.

*Resolved*, That our thanks are hereby extended to the citizens of Augusta and the Kennebec Valley for the generous hospitality given to the Society; also for the liberal special prizes they have given to encourage Maine fruit growers to exhibit the products of their orchards.

*Resolved*, That our thanks are extended to the Maine Central Railroad and Grand Trunk Railroad for excursion rates over their lines.

*Resolved*, That we are under special obligations to the local press for the wide spread publicity they have given the meetings and for the extended reports they have given of its transactions. We would also extend to the Maine press at large our thanks for similar courtesies.

*Resolved*, That we regret to note the absence of any exhibit of fruit from the State Farm at Monmouth at the New England Fruit Show, Portland Exhibition and our own exhibition here.

*Resolved*, That the members of the society hereby express their thanks to our officers for the efficient services they have rendered the fruit interests of the State.

For the committee,  
D. H. KNOWLTON, *Chairman*.

Voted, that the report be accepted.

Voted, that a committee be appointed to take under consideration the matter of the Maine Fruit Farm. The president appointed John W. True, New Gloucester, F. H. Morse, Waterford and Stanley Bisbee, Rumford Falls.

W. H. Conant read the report of the committee on the president's address, as follows:

*To the Officers and Members of the Maine State Pomological Society:*

Your committee appointed to consider the annual address of the president respectfully submit the following report:

1st. We heartily approve of the recommendations embodied in the address.

2nd. We move that a committee be appointed to devise means for carrying these recommendations into effect, said committee to submit its plans to the next annual meeting of this Society.

R. T. PATTEN, Skowhegan,  
W. H. CONANT, Buckfield,  
V. P. DeCOSTER, Buckfield.

Voted, that the report be accepted. The following were appointed a committee as recommended in said report: R. T. Patten, Skowhegan; W. H. Conant, Buckfield, E. F. Hitchings, Orono.

Voted, that in view of the efficiency with which our outgoing president has managed the affairs of this Society, we extend to him our thanks and appreciation by giving him a rising vote, which was accordingly done.

Adjourned.

DR. TWITCHELL: We have with us the old Secretary of the State Pomological Society, a man who has served the society well and faithfully for years, a man who is interested in pomology and a man who did an infinite amount of work in building up the society and keeping up the interest during all the years that he served it. I know we would like to hear from Mr. Knowlton.

MR. KNOWLTON: *Mr. President and Gentlemen:*—I am exceedingly glad to be here with you and to know of the increasing interest in the affairs of the society. I feel especially grateful for this, because years ago the society was struggling to make itself felt in the State. At the present time we have evidence that it has been growing all these years, and I think we may now recognize as a matter of congratulation that its influence in the State is greater and far more important than it ever was before. This influence has only begun, for the work in the future is to be far greater than the work in the past has been.

There are certain measures which are pressing hard upon the fruit growers of the State. One is the importance of providing in some way for some general storage of our fruit. We do not quite realize that when we sell a barrel or a carload of fruit at the present time it goes to some city and is held in storage until it is ready for the consumer. Sometimes that extends over several months,—in the case of the late keeping varieties four, five or six months, and storage in the city of London or in the city of New York, or Boston, costs a good deal. The farmers do not realize that the cost of that storage must in some way come out of what the fruit is actually worth. In other words, the farmer who produces the fruit has to pay for that storage. What we need throughout the State is some system of inexpensive storage by which the fruit of the State may be held economically until it is wanted for market.

The importance of marketing the fruit is so great that this is a question that we should talk over, it seems to me, and consider at every meeting of the society, hoping that eventually some plan will be formulated which will be feasible and helpful to the fruit growers in selling to the best possible advantage their fruit.

I thank you very much for the opportunity of saying these few words to you.

DR. TWITCHELL: It gives me pleasure at this time to present an old friend and co-worker in the agricultural field, one with whom I have traveled many miles and spent many days during the past twenty-five years, one whose devotion to agriculture has not been excelled by any one in the Dominion of Canada and who now is Secretary of the Department of Agriculture at Fredericton and has come over to see Maine fruit and a little of what Maine is doing along these lines. It gives me pleasure to present to you Hon. W. W. Hubbard, of Fredericton, N. B.

MR. HUBBARD: *Mr. President, Ladies and Gentlemen:*—I notice that your program is full of good things and therefore it would not be wisdom on my part to attempt to trespass on your time. I can only say that it gives me a great deal of pleasure to be able to accept the kind invitation of my good friend, your President. We think a great deal of Dr. Twitchell over in the province of New Brunswick where we have been favored with his presence and his teaching ability in years past. I am very glad indeed to be able to see what you are doing in apple growing. Your soil and climate here are very similar to what we have in the province of New Brunswick, your nearest neighbor to the east. One people as we are very largely, with common aspirations and hopes, working out our salvation as best we can in the development of our respective countries, I am sure we can only gain by friendly intercourse, and therefore I am very pleased indeed to meet so many good friends interested in agricultural and fruit growing development as I have had the pleasure of meeting here today. I must congratulate you very, very heartily indeed on the exhibit that you make here at this time. We had a little fruit show in St. John the other day that was perhaps larger in quantity but not any greater in variety, and in fact not so great in variety, for we are not, perhaps, growing the same number of varieties of apples successfully as you are here. We haven't begun to develop our fruit growing business in the province of New Brunswick to the same extent that you have. Just last year we appointed a horticulturist and began to take the subject up systematically. But we feel that we have a great opportunity to develop a very

large and lucrative business for the people of the country in the growing of some of the very best varieties of apples that are wanted on the markets of the world today. Of course when you get high quality of fruit it means high quality of men to grow it; it means great care; it means thorough, systematic work from the planting of the tree—the preparation of the ground I might say—right up until the apple is placed without flaw or blemish on the consumer's table, and we must work for the extra reward that we want every time. I came here to learn, and to see, and to meet you good people, not to talk to you, but I might perhaps throw out, as the President has suggested to me, a hint in regard to the value of co-operation among fruit growers for the purpose not only of growing fruit successfully, but more particularly of marketing it and getting the full value for it. The province of Nova Scotia, as perhaps some of you are aware, has for the last twenty-five years been one of the prominent fruit growing sections of the Dominion of Canada, but it is only within the last two years that the fruit growers there have taken up this matter of co-operative marketing. And this year I am glad to be able to tell you that while they have had a very much larger crop than they have ever had before to handle, they are moving it off to different foreign markets, to the Canadian Northwest, and getting more money out of it than they ever have in the past, and largely through their judicious system of co-operative handling and marketing. Somewhere between fifty and a hundred thousand barrels have gone to an entirely new market for Nova Scotia, through the co-operative societies, in the northwest provinces of Canada, this year. Some eight thousand barrels have already gone and perhaps as many more are contracted for, to the German market, a lot are going to Holland, and then of course the main body of the crop goes to Great Britain and is largely distributed through London, to which market so many of your nice apples go. I believe that no better work could engage the attention of your Association here. It has done good work in the past I know, and I must congratulate the officers of the Maine State Pomological Society for the grand good results they are getting from the work that they have been so patiently and persistently doing in the past years. I have watched what has been done here with a great deal of interest and am glad to see the



results of the labors of this pioneer association getting down now to a point where the people of the State must begin to recognize the value of such kind of work. I hope that the Legislature will extend very generous aid to the Association in the work that it is trying to do. It would be idle on my part to refer particularly to the exhibits here because I don't profess to be much of an expert in fruit myself. I have been watching very interestedly the little experiments that we have been trying to make throughout the province of New Brunswick in regard to the adaptability of varieties to different sections. I was glad to notice the many good points that your President mentioned in his annual address, and I was particularly impressed with the point that we must study and find out just how the soils, climatic conditions and other influences affect different varieties so that we may make the best of our local opportunities. That is a matter that is well worthy of investigation. We have just started on that in New Brunswick. We have some twenty-seven different stations planted out under the department over which I have the honor to be the deputy head, and our horticulturist has every tree numbered with a view to keeping a sort of diary of the doings of that tree from the time it is planted until it comes into bearing. We are asking the men who have these orchards on their farms to carefully keep the records and we hope that in the next ten or fifteen years we shall have a lot of valuable information from the apples in at least twenty-seven or twenty-eight different localities throughout the province, to be a guide as to what localities are likely to give the least danger of failure. And we also illustrate on these sample orchards the system of cultivation and care and fertilization that we believe to be the best for the different sections in which they are planted, so as to give an object lesson of what sort of success a man may hope to have in an orchard in that particular location by following out the lines of work and selecting the varieties that are doing best in these orchards. We also follow up as far as we can educational work in spraying. The past year we took three different orchards, old neglected orchards to some extent, in different parts of the province, and had our horticulturist demonstrate there proper pruning and spraying and fertilizing and harvesting and marketing of the crops. And of course this year was a very favorable year for

getting good results from good work, and we were very much pleased with the results that we got from those demonstrations. And in general I find that the interest that we are taking as a province in promoting the growing of apples is having a very great effect in calling people's attention to the fact that we can produce such dessert apples as the McIntosh Red and the Fameuse, or the Snow apple, and a few other apples of high quality like that. We can produce these just as well as, and we think a little better than almost any other part of the world; and by putting these in an experimental way on some of the markets and calling attention to what we can do, the result is that we are beginning to attract the attention of people who have money to invest in fruit growing, and we hope in that way to develop very much more rapidly than if we depended on the farmers who are making simply a side line of orchard growing.

I can only say again, I thank you very much indeed for giving me the opportunity to say a few words, and that I hope, situated as we are here with an invisible line between us, that we will continue to live with the very best of friendly feeling between the two countries. You have your political ideas and are developing in your own way; we on our side have ours, and you will pardon us if we prefer to keep to our way of developing. I think that we have abundance of room to build up a large and prosperous nation, an integral portion of the British Empire, right here in close proximity to you, and I hope that the existence of these two peoples on the North American continent will be for their mutual benefit and mutual advancement.

## TWO YEARS' WORK AT HIGHMOOR.

By W. W. BONNS, Horticulturist, Maine Agricultural Experiment Station.

*Mr. President, Ladies and Gentlemen:*

In the year 1909 the legislature of this State appropriated the sum of \$10,000 for the purchase of a farm whereon the Maine Agricultural Experiment Station could conduct experiments in orcharding and other agricultural pursuits. Some time later in that year Highmoor Farm was selected for the purpose by a duly appointed committee, but actual possession was not obtained until late in the summer of 1909. There was indeed little that could be done that year in the way of agricultural operations; fertilizer was applied in small amount in the orchards, the trees were sprayed once during the summer with bordeaux mixture and in September they were subjected to their first regular pruning.

Orchard renovation, therefore, in its real meaning, comprising as it does the care of the plantation throughout the entire season, did not really begin until the spring of 1910. The results of the work since that time have been gratifying to those who have been connected therewith and not without significance, we hope, to Maine orchardists in general and to the members of this Society in particular.

The interest of this organization centers chiefly, if not wholly, in the production of fruit; for that reason I shall omit all discussion of the experimental work at Highmoor Farm involving other crops, some of which come wholly or partially within the domain of horticulture. You are interested, I take it, in hearing about apples. It is, therefore, of apples that I purpose to speak.

Let us return to the summer of 1909, when the speaker first came to Highmoor. A sorrier lot of trees it has rarely, if ever, been his misfortune to see in any planting that aspired to the name of orchard.

The total number of living trees was close to 3200. These, planted so far as we have been able to learn about 25 to 28 years ago, were well advanced on the road to death from injury and starvation; indeed some were already so far gone that they have since been mercifully relieved of a useless existence, and turned to good account as fire wood.

In size these 28 years old trees resembled normal 10 and 15 years old ones, so slow had been their wood growth. The foliage was of the pale yellow-green color so characteristic of vegetation in an abnormal condition. The tops were a tangled mass of intertwined branches and twigs. Limbs were overgrown with lichens and mosses. Foliage was peppered with the leaf spots of numerous fungus parasites. Apple insects of nearly every kind common to this region here found congenial abode, and were rearing their generations to be counted as individuals in the tens of thousands.

Nor was parasitic life the only factor that had been at the work of destruction and devitalization. All the orchards had for years been under a thick sod of the toughest witch grass, which, besides exhausting the soil of the moisture so necessary for tree development, harbored great numbers of field mice. These in turn wrought havoc in the orchard in the winter months, taking their toll of the youngest trees, in the earlier days, and inflicting serious damage on those of greater age. In addition, several orchard fires of more than ordinary severity had run through the grass during the four or five years previous to 1909, inflicting very marked injuries to trunks and roots.

This, in brief, was the legacy of the horticultural division of the Station from the preceding owners of the farm. Here was a typical neglected orchard. Could it be successfully renovated? Could it be made to pay? Here was a problem which, if not abstractly scientific, was of direct and vital import to the fruit growers of this State. We have not yet come to the final word, but we have some results to submit that should be of interest.

As aforesaid, the trees were sprayed once in the season of 1909—the first part of June with bordeaux mixture of the 4-4-50 formula, with three pounds of lead arsenate added. The insecticide was successful in checking insect depredation, although the most telling injury had been effected before the

Station took charge. In regard to fungus control, the bordeaux was doubtless no less effective. But here, also, too much damage had been done before the application. The foliage, moreover, sapped of its vitality by lack of plant food and already injured by insects and fungi, exhibited a characteristic injury that bordeaux very frequently produces under the conditions just mentioned.

About the last of June the trees received a moderate application of chemical fertilizer, containing the three necessary elements, nitrogen, phosphorus and potash, and especially rich in the first named. 300 pounds were applied to the acre. Apparently the witch grass received all the benefit of this, judging by its thrifty condition when the speaker arrived in September of that year. The trees had to all appearances profited nothing.

That fall all the trees received their first pruning. The immense amount of tangled growth that formed the tops of the trees made necessary a plan of pruning somewhat different from that which one would conduct in an orchard in thrifty condition. Had all the wood been removed that season that was necessary for the proper shaping and thinning out of the orchard, the result would have been a stimulus to wood growth that would doubtless have delayed the production of fruit for several years. It was, therefore, decided to extend over a period of three years the pruning that might properly be done at that time, thus gradually shaping the trees to the desired heads and at the same time allowing greater opportunities for the formation of fruit-buds by avoiding undue vegetative stimulus.

No trees in any number were removed in this first season. It was desirable to see what response even the greatest cripples would make to one season of thorough care.

The keynote of the campaign of 1910 was cultivation, and this was begun as early as the ground could be worked. All the orchards on the farm, except certain experimental plots, to be discussed later, were put under the plow. The thick sod of witch grass, tough as a carpet, was finally well subdued by the plow followed by the cutaway and spring-tooth harrows. Cultivation was as continuous as the conditions of the season demanded, a fine soil mulch being maintained and the weeds kept down until the end of July, when cultivation ceased. A cover crop of rye was sown in one orchard, winter vetch in another,



and in the largest Ben Davis planting the weeds were now allowed to come up for the purposes of winter cover.

During the season the trees were sprayed three times at the proper intervals and periods: when the blossom buds showed pink at the tips; immediately after the petals fell; and from ten days to two weeks later. With the exception of some experimental plots, where the sulphur sprays with lead arsenate were used in comparison with bordeaux and with unsprayed trees, bordeaux mixture was the fungicide used in all the orchards, combined with lead arsenate for insect control. The results of the spraying experiment, reported at your meeting last year, need not be dwelt upon in detail at this time.

We have said that all the orchards were put under the plow. This is true if we except three plots of about 1 1-4 acres each, one of which was pastured to sheep, one to hogs, and the third left in grass just as the Station found it. With the exception of these three plots and of two others of about equal area, of which we shall speak presently, all orchards received high-grade, chemical fertilizer at the rate of 1500 pounds per acre.

Of the two other plots just referred to, one was treated with eleven loads of stable manure, to be compared with its neighbor, treated with a complete chemical fertilizer at the rate before mentioned. The object of this was a study of purely organic versus purely chemical fertilizer for apples. This experiment is to run for a series of years and the results are not yet definite enough to make deductions therefrom.

The results of this year were evident. They were not expressed in terms of a large crop but in marked evidence of response to treatment, with good prospect of fruit production in the near future. At this time one could determine with practical certainty which of the trees were beyond hope of redemption at any reasonable cost, and these were removed. In number they totaled about 500, so that at present there are about 2500 trees at Highmoor, although not all of them of size sufficient to bear much fruit.

The greater portion of the season's crop was picked from the Ben Davis orchard, used for the specific experimental work. The trees sprayed with the lime-sulphur preparations produced excellent apples—large, well colored, free from parasitic injury, with a fine gloss. Nearly all the fruit sprayed with bordeaux

showed spray injury to varying degrees. The seasonal conditions at spraying time are to be held responsible for the greater part of the damage. The results on the lime-sulphur plots were so markedly superior, that it was substituted for bordeaux in the general spraying of this past season. In order that I may not encroach upon your time, let me say that the results of last year's and this season's spraying experiment will be available to you before long as a bulletin of the Experiment Station.

The work of the season just passed has been a repetition of the preceding one in point of general orchard management—early and repeated cultivation, spraying, borer hunting, pruning, fertilizing. This year but 1000 pounds of a high grade, chemical fertilizer were applied per acre, and this season such application was made on the plots pastured to animals as well as on the sod plot.

In addition to the continuation of the experiments of the preceding season and a spraying experiment revised on the basis of the first year's results, including co-operative work at Greene, the new work along horticultural lines has been the inauguration in collaboration with the department of Biology, of an experiment in the breeding of apples. This has for its object the accumulation of scientific data bearing on the problems of heredity in general and their application to apple production in particular, with special reference to the production of an apple more particularly suited for commercial purposes under Maine conditions than any of the standard varieties now grown. Time alone can tell what the results may be. At present the work is in its inception. Crosses have been made, and fruits obtained. Seedlings are also being studied in connection with this problem.

The beginning of another study bearing definitely upon Maine conditions may be seen in a nursery of 3000 trees set out the past spring. These are to be the basis of a fundamental experiment dealing with the moot question of the relation of stock and scion.

Two separate divisions of the orchard have this season been devoted to an experiment with a fertilizer excessively high in nitrogen, similar to the well known Fisher formula, comparing the former with one more evenly balanced in its constituents. This being its first year, no definite results have appeared.

So much for the work of the past and the plans for the future. What are the results already obtained?

For the actual figures expressing the results of the experimental plots, I must ask your indulgence until their publication in the near future in bulletin form, as there has not been sufficient time since the harvesting of our large crops to arrange and condense them for presentation at this meeting. Suffice it for the present to say that the spraying experiments conducted not only at Highmoor, but also the co-operative work at Greene in the orchards of Messrs. Keyser, Coburn and Philbrook, indicate that lime-sulphur as a fungicide has come to stay, unless something still better takes its place; that its use can be recommended with lead arsenate, and that it is greatly to be preferred to bordeaux, especially on varieties susceptible to spray injury, even when weather conditions are most favorable. The season just closed has been inimical to the development of fungi and hence favorable to the production of clean fruit. In view of this, striking results in the way of comparative data could not be expected.

The question of animal pasturage for orchards has been quite definitely settled, so far as conditions at Highmoor are concerned. Remembering that these plots received identical treatment with that of the rest of the orchards, except in point of cultivation, be it noted that the sheep orchard pastured with five animals yielded this year at the rate of 6 1-2 barrels per acre, the hog plot 16 barrels per acre, and the cultivated plot adjacent at the rate of 127 barrels per acre.

The trees in the sheep plot were moreover in markedly less thrifty condition, judging by the color of the foliage and the amount of wood growth; and this was also true, although to a lesser degree, in the hog pasture. The hogs, also 5 in number, did not root evenly, nor were grass and weeds kept down except in small scattered patches. In general the results confirmed the experience of years of practice by the best orchardists throughout the country irrespective of region; it pays to use the plow wherever and whenever possible.

Still greater is the folly of maintaining the orchard year after year in sod. Bearing in mind that in the sod plot in our experiments the trees received the same amount of fertilizer and

identical treatment as regards spraying, pruning, etc., note the results at the close of the second season.

In sod are fifty trees nearly all of the same size as the neighboring ones under cultivation. These fifty trees produced this year 11 barrells 1 1-2 bushels of apples, of which 7 barrells 1 1-2 bushels were on the boundary line of the plot, and hence were cultivated on one side. Strictly speaking, these may be considered out of the experiment. We then have 38 trees in sod yielding 4 barrells, compared with 137 trees in cultivation yielding 254 barrells; and these 137 trees produced fully 70 per cent of the crop of the preceding year.

The foliage of this year, with the exception of the trees in sod, left nothing to be desired. It was dark green, dense and comprised of very large, vigorous leaves. The wood growth also was excellent, ranging from 8 inches to as much as 3 1-2 feet in the case of the smaller trees. The only exceptions were the occasional trees that had suffered severe winter injury. On these the leaves turned color early in September and were not as dark in color during the summer. The foliage is still adhering to the branches while the uncared for trees in the vicinity have been bare for weeks.

What of the orchards as a whole as regards the general proposition of renovation?

The crop of 1909, following the summer when the farm came into the possession of the Station was 90 barrells of marketable apples.

The crop of 1910, after one year of attention, was 275 barrells.

The crop of 1911 consisted of 2450 barrells, of which 2006 barrells contained no fruit smaller than 2 1-4 inches, of magnificent color and free from worm holes or fungous spots of any kind. As for codling moth, we would venture as a conservative estimate that not 2 barrells of apples infested with this insect were picked on the farm.

This crop was almost wholly comprised of Ben Davis fruit. The Baldwin orchard, which was in the worst plight, has begun noticeably to revive, but we may say as yet that it has only begun. Another year or two will see it bearing its quota of the crop. Even still greater crops may be expected when we remember that the largest Ben Davis block, comprising about 1000



small trees, has not reached more than one-third of its possible bearing ability.

Quite remarkable was the contrast in size of fruit on the sod and cultivated plots. Apples of high color from the latter averaged for many trees 370 to 400 fruits per barrel, and many times was a half bushel basket filled by the pickers with 65 to 75 fruits. On the other hand, there was scarcely a bushel of all the fruit from the sod plot, excepting here the outside row before mentioned, that was large enough to pass for No. 1 grade; and many of them could have successfully passed for a new variety of Crab. The trees in sod, moreover, were strikingly unthrifty; the bark had an unhealthy reddish color; the leaves were small, scant and of a very pale yellow-green.

No one factor can be rightfully regarded as of greatest importance in orchard renovation. We must spray annually and thoroughly to control the parasites of the apple. We must practice orchard sanitation in all its forms. We must fertilize in some form or other, although this is an individual problem for every orchardist, depending upon his local soil types and conditions: but the soil must not be robbed of plant food without a return. We must prune judiciously, keeping our trees within bounds and in convenient and economical shape, giving them sanitary conditions of light and aeration, opening the tops that the fruit may have all the advantage of the sun's rays.

And, finally, we must cultivate. We must plow and harrow, and having plowed and harrowed, we must keep on harrowing. If I were asked to name one factor that I regard as contributing more than any other to the renewal of vigor in our orchards at Highmoor I would name cultivation.

I realize that in this uncompromising advocacy of cultivation I shall meet the opposition of some of you men whose trees, receiving good treatment in every other way, stand in grass from year to year. They are thrifty, they bear good crops of well-colored, fair-sized fruit. Owners of such trees see no force in the argument for cultivation.

We would admit as much. When a man can say "I do thus and so and the results have always been good," there is no argument to the contrary,—in his particular case. But the fact still remains, based on decades of experience in all regions, that an apple tree when grown for profit must in 99 cases out of 100



be subject to cultivation. It is the vast aggregation of experiences and the recognized causes behind them that establish the principle.

Why do we cultivate, you may ask. Some one may urge that trees under wild or natural conditions sprout, develop and mature in uncultivated soil; that forest trees do so and wild apple trees as well. All of this is beside the point. It is true, but it does not meet the issue. We must bear constantly in mind that agriculture is an *art of man*—not a natural phenomenon; that man, when he sows the seed, expects to improve upon unaided nature by his own efforts. And it is these efforts that have developed the arts of agriculture and horticulture.

Corn was originally a wild plant and has attained its present high state of development through culture. Does any sane man plant his corn on a sod patch? Yet there are many men who buy good nursery stock, set it out in a pasture and expect a benign Providence to do the rest. When farmers and so-called orchardists realize fully that a fruit tree is an agricultural *plant*; that it requires warm, well-drained, aerated soil, freedom from undesirable plant competition and sufficient food and drink, they will be on the way towards a rational system of orchard treatment.

Until we study the question, the role that cultivation plays in promoting the desired conditions for plant growth is scarcely appreciated. Time will not permit a discussion of the different ways in which cultivation benefits. Let me briefly enumerate them, and consider but one.

#### CULTIVATION AIDS THE TREE.

*First:* By improving the physical condition of the soil. This it does in three ways:

1. By reducing the size of the individual soil particles and increasing the surfaces presented to the roots.
2. By increasing the depth of soil; i. e., by allowing a greater root run.
3. By warming and drying the soil in the spring.

*Second:* Cultivation augments the chemical activities in the soil.

1. By helping to set free plant food.
2. By hastening the decomposition of organic matter in the soil.

3. By promoting nitrification, the process by which certain bacteria in the soil convert unavailable organic material into chemical forms that can be directly used by plants.

*Third:* Cultivation conserves soil moisture.

1. By increasing the water-holding capacity of the soil in rendering the latter more porous.
2. By preventing evaporation of soil moisture.

The importance of moisture conservation could hardly have failed to impress itself upon Maine farmers and orchardists this past season. We have had in succession three very dry summers in the fruit region and the last one was the driest. At Highmoor Farm the rainfall from April 1 to June 12, a period of almost eleven weeks in the most critical time of tree activity was 1 3-10 inches. To the end of the third week in July, covering practically 16 weeks, the greater part of the growing season, the total precipitation was 2 6-10 inches. Nevertheless, the orchards suffered in no way from lack of moisture, and it is doubtful, considering the crop as a whole, if the size of the fruit, already referred to, has been excelled in this State under the most favorable conditions in regard to rainfall in any season. In the weeks following the end of July abundant rain fell, which of course aided much towards increasing the size of the fruit.

The small amount of rain that fell at intervals in the long drought was conserved by the fine dust mulch produced by harrowing. This idea that frequent stirring serves to prevent rather than hasten the drying out of the soil may seem at first thought absurd. Its truth, however, is easily proved by a simple experiment, the results of which the speaker gave at the field meeting of this Society last August, and which your President has asked me to repeat at this time.

Three light wooden boxes, 8x8x10 inches, were lined with paraffin to make them water tight. Into each moist soil of uniform nature was lightly packed. The surface of the first box was left undisturbed throughout the experiment; that of the second was thoroughly scratched or raked daily to the depth of about one-half inch to imitate the work of a harrow. The third box after filling with earth was covered with a sod, which rooted in the soil.

These boxes were placed in the open, and protected from rain. They were weighed at the beginning of the experiment and at intervals for four days. The following results show the loss in ounces from the original weight:

TIME.	Not Cultivated.	Cultivated.	Sod.
After 5 hours.....	2 oz.	4 oz.	6 oz.
After 1 day.....	4 "	4 "	8 "
After 3 days.....	7 "	5 "	18 "
After 4 days.....	10 "	5 "	25 "

The total losses in water from the uncultivated, cultivated and sod boxes were respectively 10, 5 and 25 ounces, or in per cent of loss in relation to weight of soil 8, 4 and 21 per cent respectively.

The cultivated plot lost 2 ounces more than the uncultivated during the first five hours. This was due to the evaporation of moisture from the top layer forming the mulch. It lost no more during the next 24 hours and only one ounce in the next 3 days, compared with 6 from the uncultivated box and 17 from the sod plot. Now, these boxes held but 37 per cent of a cubic foot of soil. On the basis of these results an acre of soil would lose from its first foot of depth the following amount of water in 4 days:

Uncultivated ..... 36 7-10 tons  
 Cultivated ..... 18 4-10 tons  
 In grass ..... 91 8-10 tons

When you remember that almost 85 per cent of each apple you see before you here consists of water you may gain a better appreciation of the extent to which sod or lack of tillage in an orchard robs the trees of the water necessary for the best development of their fruits. And no account is here taken of the immense amount of additional water that is daily needed by the trees themselves to perform their functions.

I do not wish to leave with you the impression that all orchards *must* be tilled, for there are too many in the State of

Maine where cultivation is either impossible or obviously impracticable. In my opinion such sites should not have been selected for the planting of trees. Since they are there, the next best thing is to conserve the soil moisture, preferably by mulching. Do not let grass grow. You cannot grow hay and apples on the same acre with profit to both crops.

On the other hand, be it understood that unintelligent tillage leads to harm. Excessive cultivation dries out the soil and exhausts the humus. It should not be carried on later than the end of July. Then a cover crop of some sort such as rye or vetch should be sown, to grow and remain until spring, when it is to be plowed under as soon as the ground can be worked. Thus the soil is supplied with the necessary organic matter which is transformed into humus and in time aids in the nutrition of the tree. Tillage without the regular addition of organic matter results in harm. For this reason cultivation and cover-cropping must be complementary. Aside from their value as sources of organic food supply, cover crops have many valuable physical properties, which cannot be discussed in the time allotted me.

In conclusion let me emphasize one point. It may be that there exists in the mind of some the conviction that we have heard expressed as follows: "Of course you can do those things—you have the State behind you." Now, as a matter of fact we have had not one penny of state aid since the farm was purchased. What we have done and are doing on a fairly large scale in the way of bringing a decrepit lot of trees into profitable bearing is what every owner of a neglected orchard can do for himself on his scale. What is required far more than great capital is the ability of each man to recognize his own conditions, to attack his special problem with judgment, undertaking only what he can successfully finish each season; and above all to be open to new ideas and to the newer agricultural knowledge. There are still too many men owning fruit trees in the New England States who are more devout ancestor worshippers than the Chinese. They travel blindly in the rut of family tradition and family practices. They pride themselves on being "practical farmers;" which would incline one to believe that Lord Beaconfield had that class in mind when he defined

the practical man as one "who practices the errors of his forefathers."

The opportunities are here. They have been admirably pointed out to you by the previous speakers at these sessions. Natural and economic conditions will give us the leadership in American apple production if we renovate our orchards and the ideas of some of our orchardists, and adopt or adapt the methods that have brought such wonderful success to the apple growers of the Pacific Coast.



## PRACTICAL EXPERIENCE TO DATE IN COMMERCIAL ORCHARDING.

PROF. F. C. SEARS.

Two years ago, I spoke before your Association on "Personal Experiences in Starting a Commercial Orchard in Massachusetts," and I want this afternoon to review briefly what I said at that meeting and to bring the matter up to date.

Perhaps I ought to explain, as I did then, that in the spring of 1908 Professor Waugh and I decided that, having attempted for fifteen years to teach other people how to conduct the orchard business, we would venture out in that business ourselves. We therefore bought 150 acres of land near the Agricultural College, which has since then been increased to 250 acres, and began setting out fruit trees. The first year we set between five and six thousand trees, and we have added to our plantings each year until now we have about 120 acres in orchards. Our main plantings have been apples, though we have also set peaches, quinces, and plums, and we expect to set a few pears the coming spring. It is in reference to the many problems we have met and solved (either rightly or wrongly) that I wish to speak this afternoon.

May I first state briefly the considerations which led us to undertake such an enterprise, for it is, of course, a very unusual thing for college professors to venture into such a work. I presume that sentiment undoubtedly had something to do with our decision, for we had both been classed with the "theorists" so long that we wanted a chance to show that our theories would work. But in the main, it was a plain business proposition with us. We wanted some business to fall back upon when we should retire from teaching and we felt that orcharding, properly carried out, offered as certain returns as one could expect to get in any ordinary commercial venture. We believed emphatically in the quality of our New England apples, and we felt that our nearness to market, our cheap lands, and our

comparative freedom from labor troubles made a combination of advantages which other sections would have difficulty in equalling. And, lastly, we did not share (and we do not now share) the apprehension of many that we are on the verge of such an overproduction of apples as will wipe out all profit in growing them. We therefore ventured forth as commercial orchardists,—at first, it is true, with some fears and many doubts, but always with a reasonable amount of confidence in the final outcome. And I believe I can claim without any exaggeration that, on the whole, our enterprise has been entirely successful to date. Certainly it has been enough so to increase our enthusiasm with every year that has passed.

So much by way of introduction. Now, just a word on the subject under discussion.

The land which we bought was not all ideal. But it was conveniently located for us to get at, being only four miles from Amherst; we could get a good block of land in one section; and, above all, the trolley line from Amherst to Holyoke passed right through it, which we considered very important, as it enabled us to get our fertilizers, etc., in by trolley, and our crops out.

The principal criticism of the land would be that it is too light and sandy in some parts. But, in my opinion, this is a good fault if one cannot have ideal land; for light soils, while more "hungry" than heavy, are more easily worked, often enabling one to get at the spring work days in advance.

A point which has interested me greatly in connection with the behavior of our different blocks is the way in which those fields whose soil was in "good heart" have given us better growth and finer trees, with less effort, than those blocks which were plowed out of old pasture or run-down mowings. I am not quite ready to say that I would defer planting the orchard for a year in order to get the soil in proper condition, for when one has his mind made up, it is hard to wait. But I do most emphatically believe that if it is at all possible to decide one or two years in advance what blocks are to be set and then grow such crops on these blocks as will put the soil in the best possible condition for the trees, it is a great advantage. A somewhat larger per cent of the trees will live, they will make satisfactory growth with less coddling, and in particular there

will be fewer trees where the growth is just a little too good to warrant one in pulling them out and replanting and yet not good enough to shape up into a fine tree.

The land for setting the first season was plowed as early in the spring as the soil was fit for working, and was then thoroughly fitted, by using a disc harrow, a spring-tooth and a smoothing harrow, and finishing with a planker. This left the surface smooth for laying off the orchard and setting the trees, by no means an unimportant item. After the trees were set, which I shall speak of more in detail in a moment, the land was kept thoroughly cultivated until time for sowing the cover crop, about July 10th. There was always a team at work in the orchard and sometimes two of them. And notwithstanding the fact that we had one of the driest seasons within the memory of the proverbial oldest inhabitant, and the further fact that our soil was shy of humus (an extremely important factor in holding moisture in the soil), there was never a time throughout the season when the soil was not as moist as could be wished just under the dust mulch. It was certainly a striking indication of the value of cultivation.

As soon as the trees are set, we apply an ounce or two of nitrate of soda to each tree, scattering it about the tree in a circle for a radius of perhaps two feet. And each spring this is repeated as soon as the soil is in condition to start growth. In addition to this, we go over the orchard again about July 1st and give a second dose of nitrate of soda, about equal in size, to all those trees which do not seem to be making a satisfactory growth.

Another point which we intend to insist on is giving the young trees a balanced ration of fertilizer from the start. I believe that a very common mistake is made by assuming that the young trees need only nitrogen for their growth and that not until a tree comes into bearing is there any necessity of applying either potash or phosphoric acid. So long as our young trees are as big as Smith's of the same age, we are content, mere bigness apparently being the only thing desired. Whereas, if our trees got more potash and phosphoric acid from the start, they would far sooner turn from weed growth to fruiting. This, I am obliged to admit, is largely theory, but it is a theory in which I firmly believe and on which I intend to act.

In order to carry this out, we have each year made up a mixture for our young trees of acid phosphate five parts and high grade sulphate of potash three parts, have put a pound of this around each one-year tree, and increased the application about a pound per year. On our bearing trees we have substituted basic slag for acid phosphate.



A great deal of care was exercised in laying off the orchard to have the rows straight in all directions and I should like to emphasize the desirability of this point, in my opinion. It is often, in fact usually neglected. Men will lay out a hen house, which is to stand for perhaps half a dozen years, and every corner must be perfectly square and every post perpendicular. But an orchard, which is to stand for two or three generations, is laid off with a plow, or the trees are stuck into holes dug at random! To me the satisfaction of having good straight rows

is worth ten times over the added cost of making them so, which after all is not great. We laid off our first row with a transit, because one happened to be available, but a man with a good "straight eye" could have done nearly as well. This first row was run along one side of the field to be planted and a stake was set every 16 1-2 feet, the distance apart for the trees. Then a cross row was laid off at right angles to this, near one end of the field. This was all the sighting that was done. The rest of the stakes were set with two measuring boards 16 1-2 feet long, with a small notch at each end. The accompanying diagram will serve to illustrate the method.

It was surprising to see how accurately and expeditiously the stakes were set. And it did not require high priced labor to do it either. Two Polanders, at a dollar and a half a day, one of whom could speak scarcely a word of English, did the whole thing, and we should be glad to compare results with anybody who has used a different method, for we feel decidedly proud of the way our trees "row" in all directions. For locating the trees we used a planting board, a device by no means new but which deserves a wider use than it gets. There are several types of them but the one we used was about four feet long by eight inches wide, with a notch at each end and one in the middle (see diagram).



The middle notch was placed against the stake set for the tree, a short piece of lath was then driven down in each of the end notches and the planting board was taken away and the hole dug for the tree where the center stake stood. Then when it came time to set the tree, whether it was that afternoon or the next day or the next week, the planting board was put in place on the two small stakes, the tree was slipped into the middle notch and was planted, and of course stood exactly where the original stake stood. Both of these methods, the setting of a stake for each tree, and the use of the planting board, have been objected to by those who profess to know about such things, on the ground that they take too much time, that they are slow and expensive methods. But when I say that the first year it cost us



just 6c per tree to set our standard apples, which we planted first, and 5c each for the peaches, which followed; and that we got the price down to 4c per tree on the dwarf apple trees which were the last set, I think you will agree that it was not an exorbitant price. This included plowing and fitting the land, staking it off, digging the holes, pruning the trees and setting them out, and the difference in cost was largely due to the fact that the gang of men setting the trees became more familiar, each with his particular part of the program, and consequently could do it more expeditiously.

The field operations in setting were carried on as follows: A gang of eight men and a foreman were used. The foreman and one man went to the place where the trees were heeled in, for a supply of trees, which were prepared for setting by pruning back the main roots considerably, and packed them into two oil barrels part full of water which were fastened on a stone boat drawn by one horse. While this was going on, the rest of the gang was setting stakes and digging holes. When the trees arrived on the scene, the whole gang went to setting, the foreman distributing the trees and the eight men dividing into pairs, one of whom set the tree while the other shovelled in the earth. About 150 trees were carried at a load and when these had been set out, the gang divided as before. In this way, the operations went like clockwork and the trees arrived at the holes with their roots thoroughly soaked and in the best possible condition to take hold and grow. And that the method was satisfactory from the standpoint of the trees is pretty conclusively shown from the records of the number that grew. Out of 530 dwarfs set we lost 14; of 250 Hubbardstons, 6 failed to grow; of 500 Wealthy, 3 died, and of 650 McIntosh, only 3 died. This is a remarkably good record in percentage of living trees even for a good season, but in a season like that of 1908, when crops of all kinds suffered severely, I think it demonstrates conclusively that our methods of planting were sound not only theoretically but practically.

Our method of pruning is peculiar, and in any event I do not suppose it would be applicable to your Maine conditions. Both of us are very strong advocates of low trees, believing that practically every operation except cultivating can be more economically and comfortably performed with the low headed

tree than with the high one. And even in cultivation, I believe that the difficulty of working about a low headed tree has been exaggerated and the need of getting out every weed about a tree has been over-estimated. Our plan has been to set one-year trees, getting strong, well grown stock, which means that the stock comes to us as straight whips 5 to 6 feet high. These we cut back the first year to 18 inches, and form the head at that point.

I shall say but a word on varieties, because I realize that this is a good deal of a personal matter, and because my views on the subject may be of little value to you here in Maine. But two points I do believe we ought to insist on everywhere here in New England. First, we ought to realize that as a rule we cannot grow the varieties grown on the Pacific coast. That is one of the most common mistakes of the novice in apple orcharding (and of many who would object to being classed as novices). A man sees their beautiful Jonathans, Newtowns, Arkansas Blacks, and Winesaps, and he says to himself, "That is the kind of fruit I should like to grow. Where can I get trees of those varieties?" And if he can get the trees and if he does not run across some one to dissuade him, he sets a whole orchard of this stuff when he ought to set Spies and Baldwins, McIntosh and Rhode Island Greening.

The second point I think we can safely insist on is *quality* in the varieties that we do set. I know I am on dangerous ground now. I know that your good President is all ready to cite me to dozens of men here in Maine who have a perfect gold mine in their Ben Davis orchards. And I have not a doubt there are plenty of men in this very audience who, if asked what variety to plant, what variety is giving them the most money, would say most emphatically "Ben Davis." But admitting, as we must, that it has been and is profitable, I believe that it is short-sighted policy to plant it. We are making a campaign for New England as the "Land of the *Good Red Apple*." And we are winning out on that basis. But do you suppose that a country which grew Ben Davis wholly or even largely could ever become known by any such name?

During the recent New England Fruit Show in Boston, I was asked to go out to lunch with a broker who (like so many others) thought he would like to grow apples. He took me to

his club and we had an apple for dessert (for which, by the way, he paid 10c) and what do you suppose it was? A Hood River Spitzenburg or a Wenatchee Jonathan? No sir, a New England McIntosh. And he told me that for the past two years this club has been using New England Spies and Baldwins and McIntosh, and other choice sorts. Do you suppose that this market for New England apples could ever have been recaptured by Ben Davis?

Another serious problem which we have had to solve, and which we have not as yet wholly solved, has been the cover-crop question. As I have said, our land is on the light order, which means that humus is especially important for it and also that the land washes badly. In consequence of these two facts, we have had to use large growing crops and also those which were good soil-binders. Our practice has gradually evolved to about this: We have found that soy beans, rye, buckwheat and rape are our best crops, with clover as a possibility on our best lands. We often handle a block of orchard as follows: About July 1st we will drill in soy beans, making the rows far enough apart to admit of cultivation. We then practice clean culture between the rows as late as it seems desirable for the soy beans, say till August 1st. Then we seed down between the rows with the last cultivation, using rye and clover, or rape and buckwheat, or any combination of the four crops, rye, rape, clover and buckwheat, that seems desirable, always including rye on any slope which is at all sharp. The advantage of a combination of two crops is that if one does not take the other will and where clover and rape, for example, are used, you get the benefit of a large amount of humus from the rape and the nitrogen from the clover.

Still another vexed question which we have had to decide, and which we perhaps decided differently from what many of my hearers would, was the question of the distance apart for the trees. We set them, as I suggested in speaking of our measuring boards, at 16 1-2 ft. apart each way in some cases and 20 ft. in others, depending on the soil. This is close planting, but that is what we wanted! It is not what we should advise for a great many men, perhaps the majority, because the trees will not be cut out when they begin to crowd each other, nor

will they be pruned in such a way as to prevent crowding as long as possible. Both of these points we intend to look out for. We have used what is called the "filler system." That is, our permanent trees are set about 33 or 40 ft. apart, but are interplanted both ways so as to bring the trees down to 16 1-2 or 20 ft. apart. For these fillers we are using such early bearing varieties as Wealthy, Wagener and Duchess of Oldenburg and for our permanent trees such sorts as Baldwin, Hubbardston, Greening and Gravenstein. We intend to practice repressive pruning, to head the trees in every year so that they will not begin to crowd for as long a period as possible. It ought to be possible to delay this crowding until they are fifteen years old at the very least. But when they *do* begin to crowd we are going to cut out the fillers and have the entire land for the permanent trees. And right here is where the difficulty usually comes in. Most men *will not cut out their fillers in time*. I hope and believe that we *will*. It ought not to be any more difficult than pruning. When we prune, we cut away part of the tree for the good of the rest of the tree. And when we remove fillers we cut out some of the trees entirely, for the good of those that remain. We may have to tell the foreman to cut the fillers and then go away ourselves and stay away till the job is done, but one way or another I expect to see those fillers come out before they have damaged the permanent trees.

The whole question of fillers narrows down to this: If a man can use fillers and bring them into bearing early enough so that they will be more profitable than growing an annual crop between the trees, and if he will then cut out the fillers, as suggested, it is a profitable scheme. But if he fails in either of these particulars then the plan is a failure. Some people object to the filler scheme because, they say, the tree has to be cut out just in its prime. But this has absolutely nothing to do with the question further than being responsible for most of the failures of the scheme. If the trees have been the most profitable thing you could have in the land while there, they have done their whole duty and have vindicated your judgment in setting them out. And the fact that if they were somewhere else they might continue to be profitable, while an interesting fact, has nothing more to do with the question at issue than the price of gas.

The last point which I wish to discuss, and one which is also largely a personal question, though there are some general principles involved, is the matter of what crops to grow in the orchard for the profit to be gotten out of the crop and not, as with the cover crops, solely to benefit the orchard. For while the bearing orchard of course uses all the land and pays a profit on it, or *ought* to, the young orchard is, for several years, a source of out-go and the land ought to be planted to some crop which will yield a profit and at the same time either directly benefit the orchard or at least not injure it.

A crop to be satisfactory in an orchard must first of all be a cultivated crop. I do not believe in either a hay-crop or a grain-crop for an orchard, whether young or old. And if the crop is to be cultivated, the more thorough cultivation it requires and the more nearly its season for cultivating corresponds to that of the orchard, the better. I am sure that a cultivated crop is usually far better for the orchard than if no crop is grown, for unfortunately the average man will cultivate his annual crops when he might neglect his orchard.

Secondly a crop, to be entirely satisfactory, ought not to disturb the soil late in the season, as, for example, in digging a crop of early potatoes. If the crop grows late in the season, which is in itself no objection but rather the reverse, it ought to be something like cabbage or squash which does not disturb the soil when gathered. Of course this objection can be overcome by planting the crop far enough from the trees, but this solution has its own weak points as we lose the use of a lot of land which might just as well be giving us a profit.

Furthermore, the crop must also be something which the owner of the orchard can either use on the farm (as a crop of turnips or mangels for stock feed), or else must be a profitable crop to sell.

The crops which we selected, having regard as far as possible to the above general principles, were beans, cabbage, and squash. They are all of them good crops and I think have, in general, proved satisfactory, and we shall use all of them another season.

We have found the work at all times of absorbing interest and for the most part our plantings have come along satisfactorily.



There have been failures, it is true, and problems without number, some of which have been solved and some of which still await a solution. We felt, during the early years of our work, a good deal of sympathy for the man who stays out of orcharding because it is a "long-time investment," but now that we have passed our fourth year, our oldest plantings really begin to look like orchards, and the interest, the enthusiasm and we shall hope the *returns* will increase with every year. Mind I am not urging anyone to go into orcharding. I am satisfied that hundreds have gone into it who ought not to have done so, but for one who understands the business and, above all, who likes it, I believe that success is assured. We hope to find ourselves among this class.

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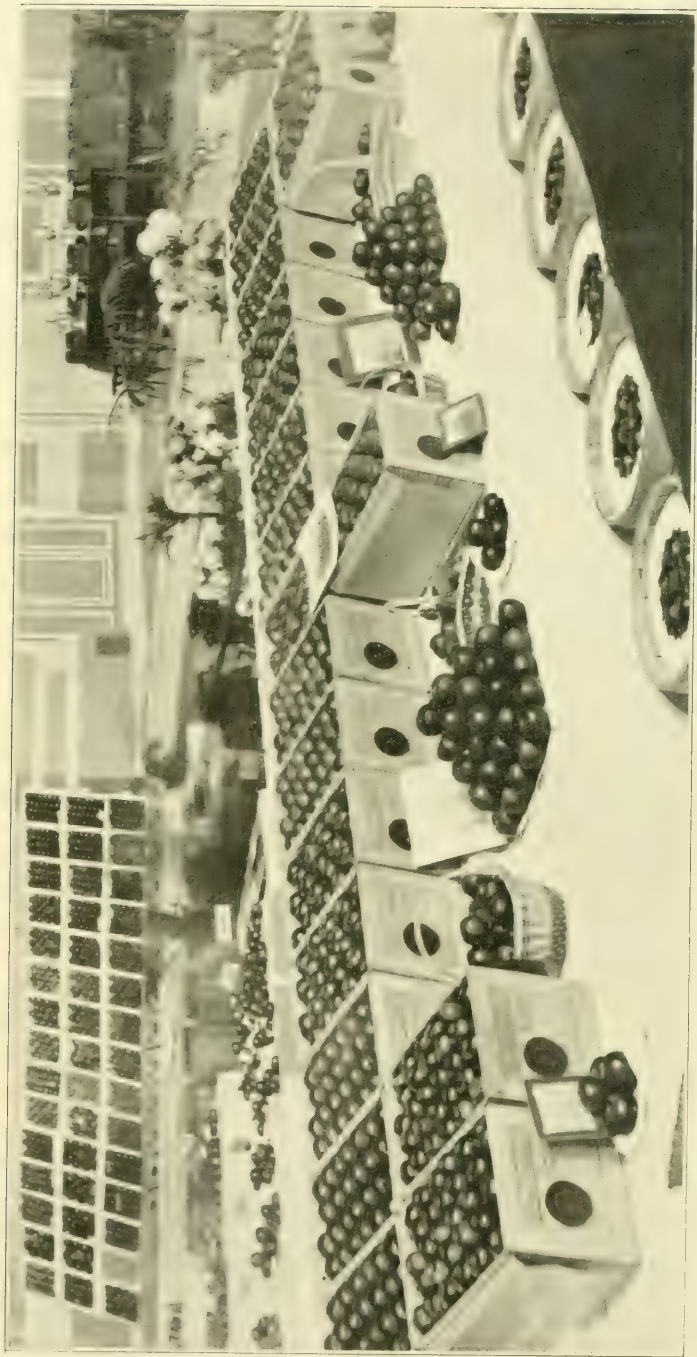


Exhibit of C. E. Hardy & Son, Hollis, N. H., at Annual Meeting State Pomological Society, Portland, November 12-14, 1912.



TRANSACTIONS  
OF THE  
Maine State Pomological Society  
FOR THE YEAR 1912



ANNUAL EXHIBITION HELD IN PORTLAND  
NOVEMBER 12, 13 and 14, 1912



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Bailey, W. G.	Freeport	Hanscom, John	Saco
Bennoch, John E.	Orono	Hardy, E. E.	Farmington
Bickford, Lewis I.	Dixmont Center	Harris, William M.	Auburn
Bisbee, George E.	Auburn	Hayes, William	Gardiner
Bisbee, Stanley	Rumford Falls	Heald, U. H.	Paris
Blanchard, Mrs. E. M.	Lewiston	Herrick, A. A.	Norway
Blossom, O. E.	Turner Center	Hitchings, E. F.	Orono
Boardman, Samuel L.	Bangor	Hoyt, Mrs. Francis	Winthrop
Briggs, John	Turner	Jackson, F. A.	Winthrop
Burleigh, Miss Clara M.	Vassalboro	Keene, Charles S.	Turner
Burr, John	Freeport	Keyser, Howard L.	Greene
Butler, Charles M.	Wiscasset	Knowlton, D. H.	Farmington
Butler, Alonzo	Union	Lang, Ivan E.	Augusta
Butnam, J. W.	Readfield	Lapham, E. A.	Pittston
Chadbourne, C. L.	North Bridgton	Leavitt, L. C.	Kezar Falls
Chandler, Mrs. Lucy A.	Freeport	Leland, Will E.	East Sangerville
Chase, Henry M., 103 Federal St.	Portland	Lincoln, E. L.	Wayne
Chase, Homer N.	Auburn	Litchfield, J. H.	Auburn
Clement & Taylor	Winthrop	Litchfield, Mrs. L. K.	Lewiston
Conant, Geo. I.	Hebron	Littlefield, Harry W.	Brooks
Conant, W. H.	Buckfield	Lombard, Thurston M.	Auburn
Conant, W. G.	Hebron	Lord, J. Merrill	Kezar Falls
Corbett, Herman	Farmington	Luce, Willis A.	Columbia Falls
Crowell, Mrs. Ella H.	Skowhegan	Macaulay, T. B.	Montreal, Can.
Crowell, John H.	Farmington	McAllister, Zaccheus	West Lovell
Cushman, Chas. L.	Auburn	McCabe, George L.	North Bangor
Dana, Woodbury S.	Portland	McLaughlin, Henry	Bangor
Dawes, S. H.	Harrison	McManus, John	Brunswick
DeCoster, Virgil P.	Buckfield	Merrill, Oliver F.	Gardiner
Denison, Mrs. Cora M.	Harrison	Merrill, Rupert B.	Gardiner
DeRocher, Peter	Bradentown, Fla.	Mitchell, Frederick H.	Turner
Dirwanger, Joseph A.	Portland	Mitchell & Co.	Waterville
Douglass, C. S.	Douglass Hill	Moody, Charles H.	Turner
Dunham, W. W.	North Paris	Moore, William G.	Monmouth
Dyer, Milton	Cape Elizabeth	Moor, F. A.	Waterville
Emerson, Charles L.	South Turner	Morse, F. H.	Waterford
Farnsworth, B. B.	Portland	Morse, W. J.	Orono
Felch, Chas. E.	Limerick	Moulton, Dr. John F.	Limington
Flint, John M.	E. Baldwin	Newell, G. E.	Turner
Frost, Oscar F.	Monmouth	Page, F. W.	Augusta
Gardiner, Robert H.	Gardiner	Palmer, George L.	Kents Hill
George, C. H.	Hebron	Parsons, Howard G.	Turner Center

## LIFE MEMBERS—Concluded.

Patten, Mrs. E. C. ....	Topsham	Taylor, Miss L. L. (Lakeside) ....	Belgrade
Prince, Edward M. ....	West Farmington	Thomas, William W. ....	Portland
Pope, Charles S. ....	Manchester	Thomas, D. S. ....	North Auburn
Pulsifer, D. W. ....	Poland	Thurston, Edwin ....	West Farmington
Purington, E. F. ....	Farmington	Tilton, William S. ....	Boston, Mass.
Richards, John T. ....	Gardiner	Townsend, Mrs. B. T. ....	Freeport
Ricker, A. S. ....	Turner	True, Davis P. ....	Leeds Center
Ricker, Fred P. ....	Turner	True, John W. ....	New Gloucester
Roak, George M. ....	Auburn	Twitchell, Geo. M. ....	Auburn
Sanborn, Miss G. P. ....	Augusta	Vickery, James. ....	Portland
Sawyer, Andrew S. ....	Cape Elizabeth	Vickery, John. ....	Auburn
Saunders, Ernest. ....	Lewiston	Wade, Patrick. ....	Portland
Seavey, Mrs. G. M. ....	Auburn	Walker, Charles S. ....	Peru
Simmons, H. J. A. ....	Waldoboro	Walker, Elmer V. ....	Oxford
Skillings, C. W. ....	North Auburn	Waterman, Willard H. ....	East Auburn
Smith, Frederick O. ....	New Vineyard	Waugh, F. A. ....	Amherst, Mass.
Smith, Henry S. ....	Monmouth	Weston, Joseph. ....	Gardiner
Snow, Mary S. ....	Bangor	Wheeler, Charles E. ....	Chesterville
Stanley, H. O. ....	Winthrop	White, Charles M. ....	Bowdoinham
Staples, Geo. W., 904 Main St., Hartford, Conn.		White, Mrs. Annie. ....	Bowdoinham
Starrett, L. F. ....	Warren	White, Edward L. ....	Bowdoinham
Stetson, Henry. ....	Auburn	Woods, Chas. D. ....	Orono
Stilphen, Asbury C. ....	Gardiner	Wright, Frederick. ....	Bath
Supt. Maine Sanatorium Farm. ....	Hebron	Yeaton, Samuel F. ....	West Farmington



## ANNUAL MEMBERS FOR 1912.

Bass, Lizzie E. ....	Wilton	Mendall, L. C. ....	Greene
Bass, Mary A. ....	Wilton	Merrill, Harvey T. ....	So. Poland
Bryant, J. B. ....	Buckfield	Millett, Charles R. ....	West Minot
Bumps, Leon A. ....	Wilton	Milliken, E. C. ....	Portland, 87 Market St.
Campbell, D. W. ....	Cherryfield	Milliken, A. H. ....	Parsonsfield
Cardmus, H. C. ....	Auburn, Route 1	Millspaugh, Lewis H. ....	Winthrop, Route 21
Carll, E. C. ....	Augusta	Moody, J. F. ....	Hebron
Chadbourne, J. A. ....	Bridgton	Mosher, Claire. ....	Wilton
Conant, E. E. ....	Buckfield	Newell, Mrs. Geo. E. ....	Turner
Conant, H. L. ....	Hebron	Nichols, Dr. Estes. ....	Hebron
Corliss, Geo. H. ....	Cherryfield	Nichols, W. A. ....	Hebron
Cardwell, Roy. ....	Hebron	Noyes, Reno P. ....	Wilton
Cornforth, W. H. ....	Auburn	Nowell, Frank E. ....	Fairfield
Davis, W. H. ....	Augusta	Page, E. E. ....	East Corinth
Dearborn, Hall C. ....	Hampden Highlands	Patch, Edith M. ....	Orono
Dearborn, Mrs. Annie S. ....	Limington	Perley, C. A. ....	Winthrop
DeCoster, Miss Helen. ....	Buckfield	Pierce, Arthur W. ....	Woodfords
Dickey, Miss E. A. ....	Greene	Pierce, Franklin. ....	Hebron Station
Dolloff, E. W. ....	Standish	Philbrook, E. E. ....	Portland, 233 Spring St.
Dunn, Charles, Jr. ....	So. Portland	Philbrook, H. H. ....	Greene
French, E. O. ....	Norway	Pike, W. W. ....	Cornish
Gardner, A. K. ....	Augusta	Pratt, B. G. ....	New York City, 50 Church St.
Granville, Harvey D. ....	Kezar Falls	Record, G. B. ....	Buckfield
Guptill, Edward G. ....	Cornish	Reed, R. C. ....	Temple
Haines, William T. ....	Waterville	Reynolds, W. E. ....	Monmouth
Hardy, Walter M. ....	Brewer	Rines, J. Henry. ....	Portland
Harris, M. H. ....	Greene	Robertson, B. E. ....	Hebron
Harrison, J. C. & Sons. ....	Berlin, Md.	Robinson, W. E. ....	No. Anson
Hawkes, Allie E. ....	So. Windham	Sawyer, C. F. ....	Hebron
Heath, Gardner K. ....	Augusta	Sawyer, L. W. ....	Greene
Hennessy, W. A. ....	Bangor	Savage, Will N. ....	Waterville
Hitchings, E. F. ....	Orono	Sinclair, W. ....	Monmouth
Ingraham, William M. ....	Portland	Small, Edgar A. ....	Cornish
Jewett, P. E. ....	Whitefield, Route 1	Smith, V. M. ....	Buckfield
Johannsen, O. A. ....	Orono	Smith, Geo. S. ....	Monmouth
Jones, George T. ....	Fairfield	Stack, Garrett M. ....	Still River, Conn.
Jones, O. R. ....	Sabattus	Stetson, C. S. ....	Greene
Knowlton, G. H. ....	Vassalboro	Sweetser, H. P. ....	Cumberland Ctr.
Leavitt, Frank. ....	Newburg	Townsend, J. G. ....	Shelbyville, Del.
Lee, Fred W. ....	Augusta	Tucker, Benj. ....	Norway
Libby, E. H. ....	Auburn	Twomey, M. Joseph. ....	Portland, 14 Wilson St.
Littlefield, J. R. ....	Brooks	Usher, E. E. ....	West Baldwin
Lincoln, Mrs. E. L. ....	Wayne	Washburn, C. C. ....	Mechanic Falls
Lang, R. D. ....	No. Raymond	Wentworth, Howard. ....	Kezar Falls
Maloon, W. L. ....	Sabattus	Wilson, Geo. T. ....	Portland, 519 Congress St.
Maxwell, J. H. ....	Sabattus	Wing, Fred A. ....	Waterville

ANNUAL MEETING  
OF  
MAINE STATE POMOLOGICAL SOCIETY,

PORTLAND, NOVEMBER 12, 13 AND 14, 1912.

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TUESDAY P. M., AT 2.00 O'CLOCK.

ADDRESS OF WELCOME.

HON. OAKLEY C. CURTIS. Mayor of Portland.

*Mr. Chairman, Ladies and Gentlemen:*

It is always a pleasure to welcome societies, conventions and gatherings of all kinds to the City of Portland, and it gives me special pleasure to extend to the Maine Pomological Society a most hearty greeting and a sincere and cordial welcome.

Portland aims to be a convention center and that was one of the main ideas which inspired the building of this auditorium and spurred on the builders to construct suitable quarters to enable the city to care for all gatherings regardless of size. This season does not mark the beginning of this idea, for Portland has been favored by visits of many organizations in the past, but we now hope to take a wider range for the future.

Portland is unquestionably destined to be a much larger and more important city than it is today. Its geographical and natural position viewed from all points is secure. It was but a few years ago (practically the span of a life) when Portland was nothing more than a seaport town. In Blunt's "American Coast Pilot" of the issue of 1833, the following reference is made on sailing instructions entering our harbor:

"In steering the above courses you will see a round bushy tree to the north of the town, and a house with a red roof and one chimney; bring the tree to west of the house, which course will carry you up the channel in six or seven fathoms of water;

but when you come abreast of the fort which stands on a hill haul away W. S. W. as there is a shoal bank on your starboard hand that has not more than ten to twelve feet on it at high water, which you are to avoid."

This was only 79 years ago and simply illustrates the crude methods of navigation, and in contrast we see the development of the present day. I refer to this more particularly as a point on which to form a basis of the steady increase in growth of the largest city in the State.

The rise of the tide in Portland is 8 to 9 feet. If you will go to Fort Allen Park where the remains of the old fort referred to now exist, and look over the hill you will see the spot in the harbor where, 79 years previous there was only two to three feet of water at low tide, and today you will see anchored on the spot the largest vessels which exist in the maritime trade and there is thirty feet of water at low tide.

Foreign steamers are continually coming to Portland and the increase in the size of them is remarkable in comparison to those of but a few years ago; and to accommodate them large expenditure has been made and as time goes on a large amount must be appropriated to keep pace with the greater development.

The growth of cities depends largely on the push and activity of their inhabitants, but the large commercial activity is caused to a great extent by the "stranger within our gates" or what might be termed the transient visitors. Boston and New York and all the other large cities are dependent more or less on the transient guests for it is this class who give life to the city, society, amusement and trade.

And so today we are particularly pleased that this active and important society comes to us and is grafting into our system renewed incentive to still greater efforts for development as a center of exhibition and display of the products and industries of our State.

We have a great and beautiful State with wonderful resources of almost every description, and all that is required is to make them known in order to attract the attention they so well deserve and be the means of promoting wider expansion and greater activity; and for these reasons it appears to me that a city like Portland is a most favorable place to hold

such gatherings, as naturally the larger the city the more people to view the exhibits and thus the more probability of creating still further interest in our industries and resources.

We people of the State of Maine, to a certain degree, know what we have, but the principal idea is to have others know it so they may become interested with their capital and energy.

The City of Portland is particularly favored with railroad and water connections, but the increasing traffic is pushing them to still wider expansion.

This State is destined to more advancement and to my mind the railroads have made but a mere scratch on the surface on what is to become a vast commercial area.

Our harbor also demands further attention as ocean commerce is taking enormous strides and tonnage is becoming greater and greater. While we have had ocean liners running from Portland to European ports for many years, the steamers are gradually becoming larger, and today some of the very largest are coming to Portland and loading with our apples and products, together with grain, cattle and in fact all farm produce from the far West.

It may be said that we are just commencing to grow, and this probably is due to the fact that Boston and New York and the large Atlantic ports are fast becoming congested and the expansion of trade is seeking new ports to facilitate shipments.

In conclusion, it is not for me to enter into the science of fruit culture, store housing and the care of your products as I notice there are other speakers to follow me who are far more capable of enlightening you on such affairs, but will say that Portland is in a position to offer you all the facilities necessary for your expansion process and for the widening of your field of advertising. We are always open to suggestion for it is our desire to have this and similar organizations come here as often as possible and we wish to extend to you every courtesy within our power and trust this visit will be so agreeable and profitable that you will decide to again hold your meeting here in the immediate future.

I wish you all success at this and all future meetings wherever they may be and hope that they will inure to the benefit of the State and profit to its people and your society.

## ADDRESS OF WELCOME.

MR. CHARLES F. FLAGG, President Portland Board of Trade.

*Mr. President and Members of the Maine Pomological Society:*

As we gather around these harvest tables like a great Thanksgiving family, I want to tell you a secret. It was my privilege to be present when the Mayor dictated your invitation from the city a year ago, and in addition to testifying to the interest and promptness of his action, I want to tell you of the undying admiration with which I heard him successfully charge upon that word "Pomological," a word before which so many other good men have gone down to humiliation and defeat. I want also to say a word to you members about your president, Mr. Howard L. Keyser of Greene. He is the smartest man I ever met. Last summer in the midst of a prolonged drought, Mr. Rines and I telephoned him about some details of this coming fruit show, and in the course of the conversation we asked him jokingly if he had seen any rain up there at Greene. To our surprise, he said, "Oh, yes; it has been raining two or three hours." Mr. Rines asked him to send some down to Portland, and he said he would. And he did. In half an hour it came: thunder, lightning, hail and rain; and the wind blew such a gale that nothing but the fear of electricity prevented our telephoning again to have him shut it off. Perhaps you have plenty of men as smart as that up the State but they are rare down here.

You come in distinguished company, you members of the Pomological Society, and we welcome with you these rosy cheeked dwellers of the orchards of Maine and New England. Like you they are products of the modern scientific world. Indeed I understand that they consider themselves such quality that they have a sovereign among them, and that Mr. Tompkins has put a crown upon his head and calls himself king. And, Mr. Chairman, with your permission, I want to say, through you, a word to King Tompkins and his subjects.

Undoubtedly, King Tompkins, you have the most brilliant company which has ever assembled in the new City Hall; but you have a great deal to answer for in the history of the world. You turned us out of the garden of Eden, you upset the king-



dom of Troy with your golden apple of discord, you gave William Tell a bad half hour when you perched on the top of little Tellie's head, and you are responsible for much apple jack and more hard cider. But for all these things we forgive you because of the men and women you have brought to Portland today.

Members of the Pomological Society, on behalf of the Portland Board of Trade with its eight hundred and twenty-five members I welcome you, and may your coming draw closer the bonds between your home and our home, so that more and more we may realize that we are neighbors. I congratulate you upon your harvest exhibition. You are steadily raising the standard of the fruit of Maine, and I can assure you that we stand ready to assist you in every way possible. I can understand why laws upon fruit marking have been imperfect in this State in the past. Rigid laws would have been like some of those whist rules, very good if one held the cards. But every year you are now producing an increasing crop of the highest quality, which cannot afford to be dragged down by short sighted and even blind legislation. You all remember the barrel of Maine "Number 1" Baldwins purchased last year in the open Boston market and brought down to Augusta and opened there. Hardly a "Number 1" Baldwin in the barrel. You may also know of the Maine man in Liverpool who said to a consignee half jokingly, "I should think you would be ashamed to beat down the price of our good Maine apples so." "Do you want to see some?" said the consignee. "Pick out any barrel you want with the Maine label on it and turn it out." And the man did, and he told me afterward that he was the one who felt ashamed.

And therefore, knowing how the name of the State under present law is liable to be abused we feel the more grateful to you members of the Maine Pomological Society who are doing so much to honor it. We feel that the time must come when the name "Maine apple" shall be such a sacred term that every marking upon the package shall be made to tell the truth, and that no man shall be permitted to inflict an injury upon his neighbor by pulling down the reputation of his State. It all comes out in the market price. I say, therefore, that we want to assist you in whatever you may deem wise and prudent.

And in this present exhibition over a hundred citizens of this city have contributed actively toward your reception and entertainment. I wish I could mention all their names, and I am going to mention Mr. J. Henry Rines and his Agricultural Committee of the Board of Trade. But in closing I desire to say for them all and for the Board of Trade that we welcome you because we know you, because we honor you, and because we believe that you are today one of the shining hopes of Maine.

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## RESPONSE.

DR. G. M. TWITCHELL, Auburn.

*Mr. President, His Honor the Mayor, Mr. President of the Board of Trade, Ladies and Gentlemen:*

It is a pleasant duty assigned to me this afternoon to express our thanks, the thanks of the officers and members of the Maine State Pomological Society for the very cordial words of welcome extended to us by your Honor the Mayor, and the President of the Board of Trade. But, gentlemen, it was not necessary that you should speak these words for us to know that we were welcome to the City of Portland, or that you were coöperating with us in doing all that was possible for the success of this exhibition. The magnificent list of special prizes, unknown by any other State Society, in all the East, has been speaking to us all these months, telling us of your desire and of your kindly interest, testifying to your appreciation of the work of this Society, to your faith in the fruit industry, to your purpose to help promote its best interests.

But, gentlemen, this is not our exhibition. Yours it is, as much as ours. We are not here to compete for prizes only. That is but a secondary matter. We are here to help build up the great fruit interests of the State, and therefore it becomes your exhibition as much as ours, and its chief purpose will fail unless every man and woman in Greater Portland visits this hall during the next two days and inspects what is spread upon the tables and in the boxes and barrels.

We have proven that we can grow apple trees as rapidly as they can in the far West. We have proven that these trees will come to maturity as early as in the far West. We have proven that we can grow fruit of a quality which the West can never hope to equal. What more do you want us to do as workers for the good of the State? This fruit spread upon the tables came from the hills of York, Cumberland and Oxford, from Franklin, Androscoggin, and Kennebec, from Sagadahoc, Somerset, and Piscataquis,—yes, from Knox and Lincoln as well; from the same hills where some of you men grew to manhood. And we want you to come back to this hall frequently and get a sniff of the old farm and of this fruit, for I venture that some of it came from the trees where as boys you used to steal apples. We want you to come back and get a fresh inspiration by this close contact with mother earth, to touch elbows with the workers, and be better men because of that contact with the giant forces of God manifested in this work before us, in the fruit on the tables. We need your coöperation for the work of the Society. We need above all—you need rather—such a show as this to prove the interdependence which must exist between all classes. The sucking power of the towns is today a serious menace to our civilization. Life, energy, growth can be maintained only as rich, fresh blood runs free upon the hillsides. The city, left to itself, dies with the third generation. It is only the incoming of the boys and girls from the hill farms all over our eastern country,—it is only in this way that new life and energy can be vouchsafed to us and that the city can make that progress which you hope to see in coming years.

The agricultural possibilities of this State insure a tremendous asset to you, gentlemen of the City of Portland. The fruit in this State is worth in round numbers about three and one-half million dollars yearly. In 1910 there were set 100,000 trees, in 1911, 120,000, and in 1912, 150,000. Properly cared for, by men who are studying the question as carefully as you are studying any of the questions which confront you in your business, do you not see that in the immediate future there must be a large increase in the revenue of the farms, and whatever adds to the value of the farm adds to the value of the

city; whatever increases the output of the farm increases the revenue of the men engaged in the many enterprises here.

So friends, we are all workers together. You can increase this work, you can help this work, by uniting with the men upon the farms in solving some of the great problems confronting them. There is the great question of unjust discrimination in distribution of our products. You can aid materially through coöperating with growers in the disposal of those products, by bringing about a more harmonious relation. Surely we can never hope for that increase in farm life and farm work in the good old State of Maine, which we desire, until there comes the incentive that can come only when the producer is receiving a fair share of the consumer's dollar. There comes to my mind just now an illustration in point. In the City of Portland during the past two months one of your grocers, paying, as he said, all that he could possibly pay, because of what he could realize, purchased apples of one of our growers, paying \$1.50 per barrel. Those apples were sold by the grocer for fifty cents per peck, or \$5.50 a barrel, and when some of the purchasers complained, the grocer said, "What can we do? We are at the mercy of the farmer." There is the condition which exists more or less everywhere, and so long as it exists you cannot expect that there will be the incentive necessary for the proper growth of this industry. Remember this, friends,—the farmer can live without you, but you cannot live without the farmer. That fact alone, it seems to me, should quicken us to a better appreciation of the need of hearty and more complete coöperation. Your industries, great as they are, your mills, your factories, your great manufacturing interests, produce nothing. You simply change the form and add to the value of the raw product. Agriculture, and agriculture alone, is the productive industry, and therefore it has claims upon you over and beyond all others. You must have fresh blood from the country if your city is to live. Uncle Solon Chase was right when he said that "the grass would grow in the city streets if it were not for the tramp of the cowhide boots in the barnyard." Remember that our dependence one upon the other must be mutual. We recognize our dependence upon you. We ask you to coöperate with us, as you never have in the past, in helping to bring about those



relations which will swell the volume of farm products, which will bring fair returns to the producer, which will lift some of the burdens from the man upon the farm, which will make aggressive and positive our agricultural interest, which will surely build up the vast resources of Maine. By thus working together, believing in Maine and laboring for its advancement, we shall find in the years, that, on the hillsides and up and down the valleys of the Pine Tree State, God has showered his richest blessings and made possible the largest, fullest, truest life vouchsafed to any people. This is indeed a goodly heritage and it is for us to enrich in every way possible. If we believe in Maine let us prove faith by honest service.

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### ADDRESS.

HON. WM. T. HAINES, WATERTVILLE, MAINE.

*Ladies and Gentlemen:*

I see by your program that I am down for an address upon this occasion. I feel that there is nothing that I could say that would be as eloquent in the cause of pomology in Maine as the splendid fruit display which you have on exhibition in this hall.

I am, as you know, always interested in the Maine farm, and I am particularly interested at the present time in the Maine orchard. I wish all those who live upon the Maine farms and have orchards could be here to witness the splendid exhibit which is the result of modern methods and the splendid care, in the line of orcharding, which some of our Maine farmers have been giving of late to this subject. There is nothing like the object lesson to teach the people, and especially the lesson in agriculture and horticulture. You are here for the benefit of this object lesson. Those who are absent do not benefit by it except as they hear of it through others, but I feel that its influences must of a necessity be very large throughout the State, and that the work which you are doing as a society will constantly exert an influence for the better understanding of the best methods of fruit growing in our State.

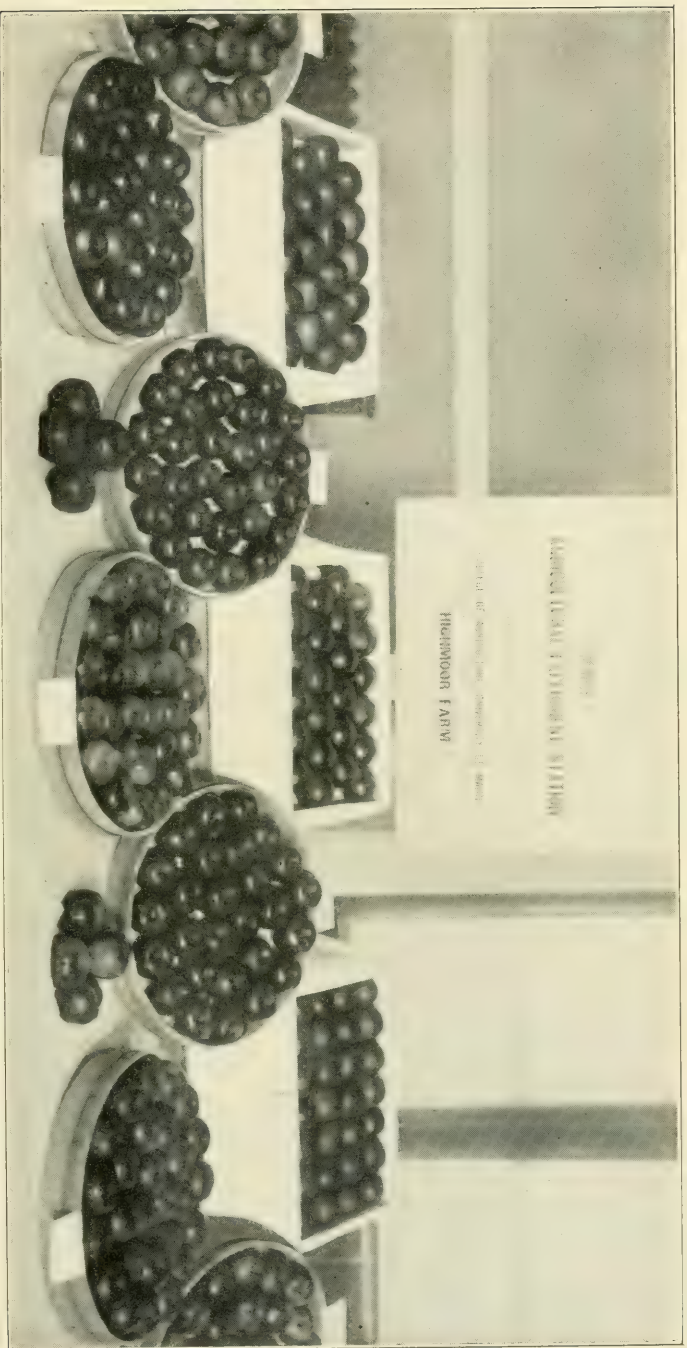


I want to call your attention, briefly, to a few facts about the Maine farm, and make some suggestions which may affect the subject of orcharding. It is well enough to know a few statistics on any subject.

The last census report in 1910 shows 60,016 farms in Maine, comprising 6,296,859 acres, with an average of 105 acres to the farm. This is an increase of 717 farms in the last ten years and a decrease of about 1 1-4 acres in the average size of the farms. The value of farm property, including farm buildings, machinery and stock thereon is placed at about \$200,000,000, an increase in ten years of nearly \$77,000,000, or about 62 per cent. The average value of these farms is placed at \$3,320, an increase of about 60 per cent since 1900. The increase in these values would seem very encouraging, but there are some things about the farm statistics gathered in 1910 that are not so encouraging, namely: The improved land is only 2,360,657 acres and slightly less than it was ten years ago, and comprises only about one-eighth the entire area of the State, and is not as much as it was in 1880 by 124,000 acres. The population of Maine seems to be divided very nearly equally between the rural and the urban. New Hampshire has lost 10,000 and Vermont 8,000 and Massachusetts has gained only 5,000 in the rural population during the last ten years, while Maine leads all New England and has actually added 6,026 to her rural population. These figures look very small in comparison with the great relative gain in the country in the farming population in the same period, which averages over 11 per cent, but it is quite a favorable comparison with the other New England states.

I give you these figures to impress upon your minds our position in the matter of agriculture. There is being so much said of late about the high cost of living, the relative opportunities in the country and the city, and the advantages of rural and city life, that it is well enough for all of us to understand how we in Maine compare with the other states. Certainly there is a chance for further development and improvement in our agricultural resources, as clearly shown by these figures.

But it was not my purpose to speak of Maine farms, but to speak particularly of orcharding, which I know you are all



Portion of Exhibit from Highmoor Farm, at Annual Meeting State Pomological Society, Portland, November 12-14, 1912.



much interested in. The same census report for 1910 gives us some very interesting data on this subject. It reports 42,976 farms as having in bearing 3,476,716 apple trees. It also reports 17,362 farms as having, *not* in bearing, 1,047,128 trees (whether on the same farms or not I don't know), making a total of 4,522,373 apple trees in Maine, and it gives the value of the apple crop gathered in 1909 at \$2,123,816, being 3,636,181 bushels, and a gain over 1899 of 1,421,773 bushels.

I remember of reading somewhere in an old publication, I think issued about 1700, in regard to the State of Maine, that it was then not determined whether apple trees could be raised in Maine or not. The report said that there were a few old trees found living, along the coast, that it was assumed had been planted by the early French settlers, but the drift of the article was to the effect that apple trees could not be raised profitably in this climate.

There are many other very interesting figures that might be given in regard to our orchard products, but these are enough to show something of the business within our borders. The past few years have demonstrated the practicability of spending more time and money on the orchards. We have found that an apple tree does not differ much from a hill of corn. It needs plowing and harrowing, weeding, and to have the suckers removed, and plenty of fertilizer to produce good ears or good apples. The scientists have come to our aid and shown us that both fungous growth and insects which prey upon the trees and upon the fruit can be avoided by the simple and inexpensive process of spraying with chemicals and poisons. We have also passed the period when we believe that an orchard can be expected to bear only once in two years,—if properly fertilized and care is taken that both years' crops are not picked at one time. So, at least, I may say that we have arrived at a stage in the understanding of the science of orcharding where we know that trees can live and thrive in the State of Maine, and this exhibition demonstrates the fact that we can produce as fine fruit as is produced anywhere in the world. More than this, if you will go to the agricultural department at Washington, you will find charts showing where different agricultural products in the United States grow naturally, and as strange

as it may seem, you will find certain sections of Maine marked upon that map as the place where apple trees grow wild.

The State of Maine has the advantage of the natural resource. The country has all been explored and settled and the period of large emigration from one section to another is passed, and it stands every locality in hand to develop to its fullest extent what it can do best. Pennsylvania has been doing this with both coal and iron; Maine has done it for years with her lumber; and the great prairies of the West and Middle West are furnishing the cereals for feeding not only our ninety millions of people but many in foreign lands. It is said that the Riverside district of California produces three-fourths of all the oranges, lemons and grape-fruit produced in the United States, and some sections of Washington and Oregon have undertaken to furnish all the apples eaten in America, and no one will doubt their ability to produce them in great quantities. But there is no state in the Union that can produce the good apples, that is, apples with the fine flavor and keeping qualities, as the State of Maine, and there is no land for sale in any other state at as low prices, that is better adapted for apple raising than is much land found in Maine.

But as we go about the State and notice these apple trees on the different farms and by the roadsides, we are all shocked at the lack of care and cultivation which these trees are getting. An occasional farm shows that its owner appreciates the value of his orchard, but the most of the trees are unpruned, the ground lacks cultivation, the leaves of the trees indicate the lack of fertilizer, and too often insects of different kinds are plainly visible within their branches. The object lesson as taught by the State Farm in Leeds, commonly known as High-moor Farm, during the past two or three years has been seen by many and its value has been far reaching, although not yet known by any very large majority of our rural population. The State is too large for any such lesson as is being taught there in this short time to be brought home to a great extent to the farmers of the State. Its influence must spread like infection, by affecting a farmer here and there in different parts of the State, who in turn shall make a similar object lesson for his neighbors to see. Thus in time by such teaching may



modern methods of orcharding be understood throughout the State.

The bulletins which are issued from our Experiment Station as the result of work at Highmoor Farm, also those bulletins which are to be had on application from the Agricultural Department at Washington by any farmer in the State, showing experiments made in orcharding in different states of the Union, are a source of help to all our farmers who have these bulletins and who read them. But comparatively few applications are made and there are thousands of farmers within our borders who have never seen or read them and whose orchards of apple trees are but a by-product in the economy of the farm. If a few apples are raised, they are so much ahead, without any labor or trouble, except the picking of them, and what are not suitable for the market are fed to the pigs or made into cider. With many it would seem that the orchard is not looked to as one of the substantial farm crops. Now, this is the condition under which we are living in regard to the orchard. A few are alive and awake to its value and importance in our State, but the great mass are asleep to its possibilities. I have no doubt that those who are awake will continue to awaken others, and that the State in the near future is to largely increase its orchard product. The 1,047,128 trees, which are young trees, are soon to come into bearing, and the gain made in the last ten years, as shown by the last census report, is small in comparison with what we may expect for a gain within the next ten years. This means that Maine during the next ten years is likely to become a great producer of apples, apples not only for its own people, but apples which may be shipped into every State in the Union, and into foreign countries.

Now, the thing that I want to speak about, and the one point that I want to make in this address—and all that I have said has simply led up to it—is the question of marketing and handling this crop after it is gathered. The question is, to whom are we to sell it, and when are we to sell it and what are we to get for it? Now, this depends upon several things: First, the quality of the apple, but that is all settled in the method of growing. The next is the manner of picking, and that is being understood to-day. The next and most important is the handling of the product at the time and soon after

it is harvested. The old method of the farmers in Maine was to take the apples into the cool, damp cellars, which were found under a great many of the homes on the farms,—put them into the bins where they were kept till such time as the farmer had the opportunity to take them to market, a few at a time, as the entire crop of most farms could be put into bins in small cellars. But this period is passed, as the most of the farmers who have any orcharding worthy of special consideration have more fruit than can be kept housed and cared for in such a way. More than this, the most of these cellars that were once damp and cool, now have furnaces placed in them for the heating of the house, so that they become dry and this is not a fit place to keep fruit in. Consequently, to my mind, one of the most important questions before the orchardist of Maine is the place in which to keep his apples until the market calls for them. There are plenty of apples throughout the middle states for the fall and early winter consumption, but after January these apples have mostly disappeared, and the Maine apple is in competition with the Oregon and Washington apple in all the markets of the East. The western apple grower has provided for the care of his apple through methods of cold storage in the large cities which provide for the keeping of them until such time as the market demands them.

The Maine apple has no provision whatever made for it, except through the buyers who come into the State in the fall, make their own bid for the apples, and carry them off, as the farmers are obliged to sell for almost anything they can get, for the reason that they have no place in which to care for them. These buyers use cold storage plants in the large cities, or ship them abroad. The Maine farmer or apple grower in most cases has no choice in the matter of the disposition of his apples. He can let them rot on the ground or sell them to some speculator for just what he will give him for them. Hence, the next step toward advancing the interests of the apple growers in the State is some manner and place for handling this crop. The Aroostook farmers have made large potato houses on their own farms, which give them a certain independence in regard to their potato crops. When they first commenced to raise potatoes, they were absolutely at the mercy of the buyer. With a place in which to keep them, they can

now hold them and dispose of them at their own satisfaction. The apple grower in this State has not even the opportunities that the potato grower has. This is the situation, and you will ask what is my solution of it. A very simple one and one not very hard to put into operation, and it is for the farmers themselves who produce apples to any great extent and who have orchards coming into bearing, to arrange for lots of land on side tracks, or where side tracks can be built near the railroad stations, along the apple growing sections of the State, upon which they can build storage houses for their apples; cold storage or such storage as will keep the apples till the time when the market calls for them. Every product has a time during the year when it is needed for consumption, and those who want it will find it wherever located. To illustrate, if there were 50,000 barrels of apples stored in different storehouses along the line of the M. C. R. R. from Waterville to Lewiston, which is all an apple growing country, the selling houses and jobbers of Boston and New York would know just how many apples were there in those houses, the minute they were filled, and the minute the market called for those apples, they would have them. In other words, they would come to the farmers for this product, and the time to sell anything is the time when somebody wants it, and when one wants to buy a product, he will pay a fair price for it. Under these circumstances the farmer would be master of the situation. The only question is, How are we to tackle the problem of building the store house? An investment of money is required, and the cost of building and expense of maintenance and care must be borne by the apple grower. What better way to get the net result to the Maine farmer than for the Maine farmer to do it himself, or for the community in which the apples are grown. And our Maine farmers have plenty of money, in many instances deposited in our Maine Savings Banks, which could be used toward this enterprise, and it is simply a matter of investing more capital in their own business. The question simply is,—Have these men confidence enough to invest their own money in this their own business?

While the Maine apple has the flavor which no other apple raised in the Union has, it can also be kept till the apples of the other states are practically all out of the market, if provision is made for properly keeping them, and the situation is entirely

in the hands of the apple grower. All he needs is the courage to tackle the problem and thereby make money on his own crop by being in a position to dispose of it when the market demands it. To my idea, it can be done through the coöperation of storage houses of a proper kind, which I believe should be built near to the railroad stations, so that the apples can be handled with a great saving of labor, taking them direct from the orchard to the storage house, and then at the proper time shipping them from there to the market.

I have listened a good many times in the past to speeches upon what ought to be done in Maine to make apple growing profitable but I have failed to hear many men discuss this question of the selling of them, the methods of handling to a good advantage the apples grown in Maine. For that reason I thought the first opportunity I had I would offer these suggestions. To my mind it is the most important question to-day in connection with the business. I have not undertaken to tell you what kind of storage houses should be made, whether cold storage or storage to keep out frost because I don't know, but it is the kind of storage houses such as are used in other places where they are cared for to the best advantage, that our Maine farmers need.

I understand that the suggestion is to be made that the State provide a cold storage plant for the apples raised on Highmoor Farm, at the railroad station near the farm. I believe this will be a very profitable experiment along this line. If done, it will be done at the expense of the State. If mistakes are made, they can be remedied and the lesson learned, and the people can all have the advantage of it. I sincerely hope it will be undertaken in the near future, because I thoroughly believe that unless we provide for the better handling of the apples grown in Maine by the farmers having orchards of five hundred, a thousand and two thousand trees, as many have, and which trees will soon come into bearing, the prices will be so poor for the crops, that it will lead to discouragement in this industry and hinder its further development.



## CO-OPERATIVE AGRICULTURAL CREDIT ASSOCIATIONS.

Address by PROF. G. W. STEVENS of the University of Maine.

*Ladies and Gentlemen:* It will be noted on the regular program that President Aley of the University was to have addressed the gathering at this time. To those of you who may have been in some degree induced to come this afternoon in the expectation of hearing President Aley, I offer my sympathy. I shall upon my return to Orono extend my sympathy also to President Aley for his failure to have opportunity to witness the magnificent display here before us, but I am reminded in this connection that there is apt to be no loss without some gain and I most heartily congratulate myself upon being here to have some humble relation to the program this afternoon and above all to have opportunity to observe this magnificent display of apple products.

The subject to which I am to address myself for a few moments this afternoon is perhaps not entirely adapted to such an occasion as this. It is one which in the nature of the case, to be presented with any fullness calls for a mass of detail that the limits of time will not permit to be presented this afternoon; and it is, of course, as the chairman of the meeting announced, one of a general character. It has no special relation to any specialized set of people in agriculture. But I am very sure that this movement, which is already finding a beginning in this country, if it advances to successful fulfillment will require as a condition of that advance the effort of just such progressive organizations as this, and therefore it is not unfitting, I am sure, to briefly consider some of the elements contained in this movement.

Agriculture as an industry has made very material advance in this country in the last several decades. The farmer has abandoned the more or less indifferent, slipshod methods in his industry. He has been acquiring information as to the methods and processes of his industry. He has been acquiring knowledge of the nature of his materials and his product. In



other words, he has been applying what we call the method of scientific agriculture to his industry. The agencies by which he has been able to do this may be summarized under the word *education*, and the specific agencies in that direction have been primarily the Federal Department of Agriculture, and under it in more or less close relation the Experiment Stations, the Agricultural Colleges, and by no means least such organizations as that here represented.

But agriculture as an industry has made less advance, so far as those features of it that we might call of economic efficiency are concerned, than any other basic industry today. In comparison with transportation, in comparison with commerce, in comparison with manufacture, in comparison with mining, agriculture has in general failed to take advantage of the economies and the efficiencies that lie before it, and we have in the experience of a foreign people methods and policies in operation in connection with this matter of efficiency that we may very well give attention to.

Not the least point in which the American farmer has failed to take advantage of the economies that are possible to him is in that of credit—the capital whereby he may accomplish more, whereby he may obtain a larger product to get a larger result from his farm, from his occupation, than he has been able to do thus far. Now the economies that we associate with the other basic industries, such as transportation, such as manufacture, are those in general that we may classify under associated effort, combined effort, the economies of large scale production, the economy of large scale buying, of large scale selling, the economy that promotes an avoidance of the leaks and wastes that have in former times been associated with all industries and have in this way been largely removed by reason of combination. Coöperation is the great form of business organization that predominates in all these other fields. It is not my purpose to enter into a discussion as to the reasons why there seems to be little probability that we can ever expect successful coöperation so far as the direct operation of farms is concerned, but we may very safely say that there are possibilities in the nature of combined effort on the part of farmers, not the least of which is in the matter of combined effort to

obtain better credit facilities. That will give to the farmer very great return indeed.

Now the principle that underlies this matter of combined credit is simply the point that a number of people by guaranteeing their combined capital, by guaranteeing their combined warranty, are able to obtain capital when they want it at a smaller cost than any of them are able to do individually. That is the underlying principle of the matter of combined credit. This may not seem to be at first thought a particularly important matter. It may not occur to us that it matters a great deal whether the ordinary farmer is obliged, as he is, to pay on an average over eight per cent interest, taking into account the cost of commission and renewal, on his ordinary loans, instead of as low a rate as three and one-half or four per cent, as the ordinary German farmer, the ordinary French farmer, the ordinary Belgian farmer, the ordinary Italian farmer, is able to do. And yet when we realize that the farmers of the United States are today operating on a borrowed capital of over eight billion dollars on which they pay an annual interest charge of over eight per cent, we perhaps get a better conception of the significance of this.

The possibilities that lie in this matter of cheaper credit, as a consequence enabling the farmer to utilize in a better way his land, are significant not only to the farmer, enabling him to get a larger net profit out of his activity, but they are of course of great significance to those of us who are not actively engaged in farming,—the consuming class. The outcome of this finally cannot fail to be, as a consequence of the larger production from the more economic processes that will be made possible, a cheaper food supply, cheaper articles of consumption in the case of commodities of an agricultural character than we have had thus far.

Now I want to briefly describe one or two of the general methods of coöperative agricultural credit that have been in highly successful operation for a long while in a number of foreign countries. There are, I may say, a variety of these organized credit associations which differ among themselves in some rather important respects, but chiefly in detail. Substantially these credit associations are all alike, and on account of the limits of time I shall not undertake today more than

rather briefly to describe two that in the judgment of those who have been making careful inquiry into the operation of these credit systems abroad are best adapted to American conditions. The first of these is the so-called Raiffeisen system, so called because of the name of the founder, a man in Germany who in about the year 1849 observed the handicap that rested on the German farmer in the matter of obtaining credit to handle his activities and organized among local groups of German farmers these so-called Raiffeisen associations. They were based upon certain, rather few, fundamental principles. One of these was the unlimited liability of each member of the association for the obligations of the association. Another feature of this system was the confining of the borrowing privilege to members of the association only. The credit of those who belonged to this association was of a personal character only. That is, there was no mortgage upon any real estate individually. It was simply the matter of combining the personal credit of those who wished to join the association and who contemplated becoming borrowers themselves to a greater or less degree. Again, the cost of maintaining these associations was made very low. There was only one officer—and that, I may say, is still the feature of this system—who received any compensation, the treasurer. And when I say that today the expense of maintaining these local agricultural credit associations averages only about \$150 or \$175 a year, we appreciate the great economy that is associated with their conduct. A further feature of these associations is a committee, a supervisory committee, that passes upon the application of any would-be borrower, who, it is to be remembered, must himself belong to the association, and inquires into the purpose for which he wants his loan. The loan must be applied to a so-called productive purpose, it would not be permitted to be applied to a consumptive purpose; a man would have to demonstrate to the satisfaction of this committee that the purpose for which he wanted this small loan was one that was reasonably likely to succeed. If in the judgment of the committee the purpose was not apt to be a successful one he would be refused a loan. The man as a borrower would also be required to have two sureties on the note he would give representing the loan, the names of two people, also themselves members of

this association, acceptable to the members of the committee. Now possibly that is enough, on account of the limits of time, as a general description of this so-called Raiffeisen system. I may say that these associations average about ninety-five people in number. They are purely local. They accept deposits from members and also from non members. The average loan, as possibly I have stated a few minutes ago, is about \$150. The average borrower makes a loan of about \$150. The average deposit is about \$300. And when I say that all the funds at the disposal of these local credit associations run up into the billions of marks in terms of German money, and that by far the greatest part of these funds is furnished by members themselves who are not at a given time in need of money and who may happen to have a little surplus of their own, it gives a better idea of the economic and valuable character of these associations.

The local associations are combined into federated groups. At the head of each group is a bank, itself coöperative in character, made up not necessarily of the members of the local Raiffeisen associations, though usually so made up. Now these banks are sort of equalizing agencies that in times when the local associations may have surplus funds on hand, loan these funds in the great commercial centers of the country, or at least distribute them there to other rural credit associations; and, on the other hand, when a given local association may have need of more funds to lend than it has at its disposal these federated banks furnish such association with the funds needed. Still above these federated banks is a great central bank which carries on substantially, except on a larger scale, the same activities that the federated banks carry on.

Over all this combined activity is exercised the very careful supervision of the German government. I mention in connection with these Raiffeisen associations which exist to the number of several thousand throughout Germany, that in the entire history of them in the sixty or seventy years they have been in operation, not a single man, not a single member who is legally responsible to an unlimited extent for any failure of a local association, has ever been obliged to contribute a penny to make up a deficit as a consequence of failure. They have been conducted with the highest degree of success.



The general purpose of these so-called Raiffeisen associations is to enable the man who may not need a large amount of funds, who is not in a position perhaps to mortgage his real estate, but who could use to very good advantage more and better utensils and could enlarge his activity in some such way as that,—to enable him to branch out in that small way as he may desire and thereby carry on his activity with a larger efficiency than he had theretofore been able to carry it on. So much for the present for the Raiffeisan associations.

Another form that has met the strong approval of those who have investigated it from this country is the so-called *Landschaften* association which in perhaps all substantial respects is similar to the Raiffeisen association, and yet in a number of important ways differs from it. It is an association of a corporate character and is based upon land mortgage, the members of which are supposed to be people who themselves want to mortgage their farms for the purpose either of acquiring more land or for the purpose of making some large improvement. Now only people who are borrowers of considerable amounts of money belong to the *Landschaften* association. There is not in this, as there is in the Raiffeisen association, any expectation of dividends simply from the holding of stock. There would be no special motive for anybody's joining a *Landschaften* association unless he expected to borrow a considerable amount of money and unless he was willing to mortgage his real estate for the purpose of so borrowing. Now in that connection I desire to call attention briefly to a contrast which we may all readily observe between the character of the credit furnished by such an organization in this country as a railroad and that furnished by the ordinary farmer. In the case of a railroad, or an industrial plant, or a mine, you have a highly negotiable instrument in the form of a bond that anybody as an investor of experience may readily recognize the character of and which has, as we say, a very high degree of negotiability. It is a very fluid instrument. It is a liquid instrument. The man who may be uncertain as to how long he will care to keep a given bond has no hesitation whatever in putting his surplus cash into that, realizing, as he does, that he can dispose of it very readily at any time he sees fit. Consider then, if you please, the difference between that and the case of the farmer who like the railroad



wants to borrow money, because of course a bond of a railroad represents nothing but a loan of substantially the same character as the loan made by the farmer secured by mortgage. In the latter case we have complicated laws governing the mortgage. They are essentially local in character. A mortgage held by a person a long distance away from the site of the mortgage is rare indeed. As a consequence of that, and primarily I maintain owing to the fluidity of the loan instrument the railroad is able to borrow at a rate of 4 or 4 1-2 or 5 per cent while the farmer with security often better than that of the railroad is obliged to pay 6, 7, and as I said earlier in the discussion on an average throughout the United States of 8 1-2 per cent. Now let it be plainly understood that the reason for this difference is not difference in the character of the loan but it is a difference in the nature of the instrument representing the loan. The theory or principle underlying the *Landschaften* association is to form an association whereby farmers banding themselves together and wanting to borrow money can mortgage their farms and have as the representation of that mortgage debenture bonds substantially similar in nature to the railroad bond or debenture bond in this country. These bonds are highly negotiable. In Germany they are generally as acceptable as the bonds issued by any industrial plant of any kind whatsoever. Now it is more commonly the case than not that a rural loan association bond can be circulated at a lower rate of interest than the average industrial bond.

Now another feature about this *Landschaften* association is a scheme whereby the farmer who as a borrower mortgages his farm, pays back his principal gradually, let us say in a period of twenty years. Suppose a German farmer wants to borrow \$10,000. Now the average rate on farm mortgage loans in Germany is 4.3 per cent. The association would require him to pay each year in addition to that 4.3 per cent, 3.2 per cent to create a sinking fund gradually throughout a period of let us say twenty years. This man would pay therefore, \$750 a year as a total upon that loan of \$10,000 that he had made, let us say to purchase an addition to his farm. He would pay at the end of twenty years \$15,000 as a total and he would have acquired in that time the piece of land that he had purchased in addition to paying interest on his loan during the time.

Contrast that with a typical case of the American farmer. I am not so sure about the conditions here as I am in the Central West with which I have been associated until very recently, but I know that on the average out there the farmer would carry the loan for twenty years, have paid over \$15,000 and have in addition not a cent toward the purchase of his land. We have maintained seemingly a very haphazard system in connection with our real estate mortgage business. The theory seemingly has been that a mortgage ought to be drawn up merely for a period of three or four or five years, whereas the statistics show that the average life of a mortgage is vastly longer than that in this country, causing very decided inconvenience at times and embarrassment to the borrower as well as the lender. Now a distinct feature of this *Landschaften* system is the sinking fund feature whereby in addition to the low rate of interest that is charged as interest the borrower is obliged to pay a slight additional rate of interest that gradually accumulates as a sinking fund, so that at the expiration of the given period, twenty, twenty-five or thirty years, he has paid for the real estate that he has purchased.

Possibly this is sufficient in general explanation of the character of the two forms of local agricultural credit associations that have been operated with such great success in foreign countries. There seems to be no doubt whatever that they are, in substance at least, adaptable to American conditions. There is no question whatever of the possibility of applying the general principles of some of these local credit associations to American rural life. It will certainly be necessary, as one condition to this adaptation, that we have strict government supervision of these associations; that we proceed gradually. The process ought to be one of building up locally. The American farmer has been a distinctive individualist heretofore. He is now in contrast with the European farmer. And undoubtedly the movement of such organizations as this will be slow because the American farmer hesitates to enroll himself in co-operative efforts with others. The preceding speaker spoke in brief upon the fact that the American farmer has lagged behind in the adoption of up-to-date and improved methods and in contrast with his industrial brother in other fields of activity in this country he has remained altogether too distinctively

individualistic. Now that individualism will have to be stopped. There is no possible question about the need of American farmers everywhere for more working capital, and if by reason of putting into operation associations of this general character they are able to obtain their loans at a rate not more than half of the average rate at the present time, and do it under circumstances that if we may judge by foreign experiences do not jeopardize the financial security of the individual farmer, that will not occasion loss if governmentally supervised, there is no reason whatever why they may not succeed. It may be of interest to know that several associations in general similar to that holding session here today have after rather careful consideration of organization of this kind, endorsed it. The American Bankers' Association has endorsed it, the Southern Commercial Congress has endorsed it, a number of industrial organizations have endorsed it. And as most of us know, the Commission appointed by Congress recently made its preliminary report only a few weeks ago, and in that report gave what may be called an unqualified endorsement of the principle of these local credit associations and their adaptability to American conditions. And I would say in conclusion that an organization such as this is eminently suited by reason of its progressive character, by reason of its organization, to at least investigate and study, and if convinced that there is merit in principles such as these, to lend aid in furthering the idea. Certainly benefit will come to you as individuals and to our country as a whole.

TUESDAY EVENING.

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ORCHARDING IN DIFFERENT REGIONS OF THE  
UNITED STATES (ILLUSTRATED).\*

By H. P. GOULD, U. S. Department of Agriculture, Wash-  
ington, D. C.

*"Mr. President; Members of the Maine State Pomological Soci-  
ety; Ladies and Gentlemen:*

A man would indeed be devoid of all sentiment if he could be in the circumstances in which I find myself tonight and not have a great many fond recollections come to his mind. Though I have not been a resident of the State of Maine for quite a good many years, a good deal more than half of my life has been spent in this State, and I have been coming back once a year for all this time that I have been absent to see just a little of my people who still live in the State. It makes it doubly pleasant when I can be greeted by some of my old teachers as I was just a few moments ago.

The course which I will try to take you over tonight will be presented in views showing some typical orchards and some typical orchard methods in various representative fruit-growing regions of the United States. The views are not in all cases quite as representative as I would like to have them, but still perhaps they may not be without some interest. A few views will be suggestive, I hope, with reference to practical orchard management.

The matter of atmospheric drainage has been a good deal emphasized in much of the horticultural literature during the past few years. It has not been over-emphasized, however, because atmospheric drainage is one of the most important

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\* Condensed and revised by Mr. Gould for publication from stenographer's notes.

considerations in selecting orchard sites in their relation to successful orcharding. To a great many it is a more or less unintelligible thing, this matter of atmospheric drainage. Two or three slides will perhaps show the effect of atmospheric drainage in such a way that even if you cannot see it you can get a very vivid idea of its results. (A view of an orange tree in Florida was here thrown on the screen.) This shows a condition which the tree displayed following a severe freeze which occurred in Florida a few years ago. You know after a very severe frost occurs while plants are in active growth the leaves will be killed and will dry right up on the tree without falling off. That is a common observation. If slightly injured, enough just barely to kill them, they will drop in a little time. These conditions were apparent in the case of this orange tree. The lower leaves were killed so entirely that they dried up on the tree without falling off. In the middle portion of the tree, the leaves were injured just enough to kill them, so that they dropped. The top of the tree was uninjured, thus showing three gradations in temperature—three climatic conditions, if you please—within the height of the tree.

The next view shows atmospheric drainage in another manner, in a large mountain peach orchard in West Virginia. The picture was taken in the morning, with a fire burning on the side of the mountain. The smoke is seen drifting down the hill showing simply that the current is downward; in other words, a visible illustration of atmospheric drainage.

Atmospheric drainage is further illustrated by two views of an apple orchard in West Virginia. There was an interval of one week between the dates on which the photographs were taken. The views show a depression between the point where the photographs were taken and the remote portion of the orchard, that portion being elevated 50 feet or such a matter above the lowest point of the depression. The earlier view shows the trees in the distance in full bloom, while those in the depression had not yet come into bloom. The second view displays the same orchard a week later, showing the trees in the distance on the elevated portion of the orchard going out of bloom, while those in the depression were in full bloom. A comparison of these two views makes it apparent that there were really two climates within the short distance indicated in



the illustration. The cold air had settled into the depression to such an extent as to retard the blossoming of the trees nearly a week in comparison with the blossoming of the trees in the elevated portion of the orchard.

Another thing of great importance in selecting sites for orchards is the soil and especially the subsoil. I am coming to lay more and more importance upon the character of the subsoil. It should be deep and porous, at least relatively so; porous enough to admit of a fairly rapid percolation of the water through it.

The next view shows a section of soil in the Ozark Region in which apple trees and other fruit trees make a rapid growth during the early years of the orchard. This rapid growth is not due to the extreme fertility of the soil as much as it is due to the great moisture reservoir that is furnished by the deep, porous subsoil.

In contrast to the last view, the one now on the screen shows a solid ledge formation within three or four feet of the surface. There is nothing on the surface of the soil to indicate that the solid rock is near the surface without an examination of the subsoil. One could very readily have purchased an area of land in the section in which this view was taken thinking that he was securing soil that was suitable for any purpose and being totally unconscious of the fact that its usefulness was greatly restricted by the character of the subsoil. Fruit trees have done fairly well during seasons of normal rainfall on soil having such characteristics as those in the section of country in which this view was taken. But the season of 1911 was one of excessive drouth following two other years that were very dry. As a result of this drouth, coupled with the fact that the moisture reservoir—that is, the subsoil—was very limited, thousands of apple trees died.

A thin stratum of rock two or three feet from the surface underlaid by good soil conditions would be equally as undesirable as a solid rock formation because of the fact that the rock stratum would effectually cut off all communication between the soil above the rock and that below."

Following these views, several were thrown on the screen showing typical orchards or orchard conditions in various sec-

tions of the country. These included a view illustrating the sod-mulching method as practiced by Mr. Grant G. Hitchings of Onondaga County, New York; a Maiden Blush apple orchard about 30 years old in New Jersey, the symmetry of the trees and the heavy crop of fruit which they were bearing being the points of chief interest; one showing a Gravenstein orchard in New Jersey which was planted before the matter of low heads had been as much agitated as has been the case during the past few years, the present orchard showing very high heads; two views showing early apples loaded at the orchard for further disposition, one going to the Philadelphia market, the other loaded with 7-8 bushel baskets ready to be taken to the shipping station.

In the same manner typical views were shown in important orchard districts in West Virginia, Illinois, Kansas, the Ozark Region, Iowa, Colorado, Washington, Oregon and California. In the Rocky Mountain and Pacific Coast States where fruit growing is confined quite definitely to particular districts and river valleys, the views shown were representative of the various districts and valleys in which important fruit interests have been developed. Several packing scenes were shown indicating packing houses, packing tables, the packing of apples in boxes, etc.

The two citrus packing houses in California were shown and commented on because of the fact that one of them was an old style packing house in which a great deal of overhead machinery was used. In this type of packing house, the fruit was elevated to a relatively high point and then allowed to drop by gravity through various spouts, runs, etc., as it passed through graders, sizing machines and other apparatus in its transit to the bins from which it was packed. The other citrus packing house was a modern one showing the changes which had been made in recent years following the work of the Office of Field Investigations in Pomology in connection with the serious losses which the shippers sustained, due to the decay of the fruit in transit from California to eastern markets. This work showed very clearly that the decay of the oranges was very largely traceable to injuries which the fruit received either in the orange groves before it was taken to the packing houses or while it was being handled after it reached the packing house.

The bruising of the fruit and other injuries which resulted from its passing by gravity through the overhead machinery shown in the old style packing house contributed a great deal to the decay of the fruit. The taking out of the overhead apparatus and the substitution of that which would eliminate all dropping of the fruit was considered essential in order that the fruit might be handled with the least possible injury. When all injuries were eliminated and the fruit was handled with the greatest possible care from the time it was picked until it was packed, the decay of the fruit was almost entirely prevented.

Similar investigations carried on in connection with the handling of other fruits have further emphasized the fact that much of the loss and other difficulties which fruit growers and fruit dealers have experienced is due to the rough handling of the fruit. Where all bruises and other injuries are eliminated, the keeping qualities of the fruit, other things being equal, are very greatly enhanced. A great many of the injuries which result in trouble in storage or subsequent to storage after the fruit is removed for marketing are due to bruises and other injuries which are almost imperceptible.

Attention was called to the heating of orchards to prevent injury by frosts in two or three views showing smudge pots, storage tanks for oil, etc. In contrast with this operation which has become a prominent one in some sections of the country in the management of the orchards, attention was directed to the fact that in Maine injury by unseasonable spring frosts was practically unknown and that the growers in this State were particularly fortunate in this respect as they had no occasion to consider the matter of orchard heating so far as the management of their own orchards was concerned.

In order to give some idea of the character and the extent of the root system of apple trees, several views were thrown on the screen showing the roots, their ramifications through the soil and some of the influences in their development. As a matter of general interest, the portable refrigerating plant which was built by the Office of Field Investigations in Pomology was shown. This refrigerating plant is used for experimental work in the fruit transportation and storage investigations conducted by that Office, the principal object of this

plant being to precool the fruit either for immediate transportation or for storage.

In connection with the view of a monument which has been erected to indicate the spot on which the original Baldwin apple tree stood, the speaker called attention to the fact that a number of monuments and tablets had been erected to mark the spot where the original tree or plant stood of some fruit which has become famous and which has contributed largely to American pomology.

Concluding his address, the speaker said:

"I have talked quite a good many times with fruit-growers in the East who have made extensive trips through the western fruit-growing regions. They have come back home feeling more satisfied than ever with their surroundings; feeling that they are able to meet successfully in competition with what their brother fruit-growers in the famous regions of the West are able to force upon them; and so if any of these views make the fruit-growers here in Maine feel that their conditions are just as good as they are anywhere else, possibly it may give you a happy feeling—happiness leads to contentment and contentment is great gain."

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## ADDRESS ON EUROPEAN HORTICULTURE.

By PROF. FRANK A. WAUGH, of Amherst, Mass.

*Mr. President, members of the Maine State Pomological Society and Friends:*

After Brother Gould has taken you all over North America it only remains for me to show you about over the rest of the world. Now the time has gone by when a man who comes home from a trip to Europe is thereby made a curiosity. Anybody can go to Europe who can grow a barrel of apples, and pretty nearly for the price of a good barrel of apples nowadays. It is as easy to go to Europe as it is to go to Boston or New York, and a good deal easier than it is to go to some of the back towns of Maine. I suppose that there are a good many people here tonight who have been to Europe, some of



them more times than I have, and some of them have stayed longer, have seen a good deal more than I have and know a good deal more about it, but I shall do the best I can in spite of that. All I can say for myself is that I have been there a time or two, that I had some little acquaintance with the country principally because my mother was born in Germany, that after going there twice and getting acquainted with the country I could find my way about pretty well because I could speak some of the language, and that I was able to stop there for five or six months on the last trip and become settled and acquainted, and so to see and understand a good many of the things which the ordinary tourist does not see and which perhaps he cannot understand.

I was located for a time at a little horticultural school near Berlin, and the first picture I show you is taken from the garden there. You will see it is a very nice, well-kept garden, that the trees are planted close together, and that, in fact, they are all of the forms which we call dwarf trees. The standard tree, as we call it, in our orchards, is almost unknown. These are dwarf pear trees which we see along the border of the walk, and these which we see here (picture 2) are dwarf peach trees growing in pots which are kept along here at the fruiting age and are used for replanting in the orchard whenever there is a vacancy.

Here is a peach tree trained out against the wall, and beside it you see blankets on rollers so that if there is danger of frost the blankets can be rolled over the peach tree and it can be guarded and kept from frost. The peach tree is very carefully trained there, very carefully taken care of.

Here in a closed garden carefully walled in on all sides are numbers of pear trees spread on trellises and very carefully trained as to form. You may imagine that these bear large quantities of fruit, as indeed they do, and that the fruit is of a very high quality, as indeed it must be to pay for all that care.

Now here is an example of apple trees trained against a work building on the grounds of the school. These apple trees are 5 years old, and have borne four crops. Each apple tree there will bear eight or ten apples of the very finest quality. Those which we see are fronting to the south. They get the best and brightest light of the day, the warmth of the sun,



and the brick wall against which they grow takes up large quantities of heat which it gives out to the fruit all through the night so that they just grow day and night. They work them there twenty-four hours a day.

We have in this picture the explanation of why they can take so much care of their fruit trees. The work is largely done by women. The major portion of their hard work is done by the women. It is a country where they have genuine women's rights. These girls, about twenty-two years old, work ten hours a day and receive forty-eight cents a day throughout the summer. From the enormous savings which they amass during the nine months of the growing season they go home and live with their parents and support the family for the rest of the year. Every house has a few fruit trees—not an orchard scattered out behind the barn as we have it in New England, but usually a few fruit trees trained up against the side of the house.

This is more of a business orchard which you see here. This is composed of cordon apple trees, each one trained obliquely to a stake and the stakes tied to a trellis. This is a business proposition and the man who runs that makes money out of it. He gets good prices for his fruit, and he puts lots of work into it so he has to get good prices.

Here we have a little inclosed garden such as we find in all private estates. This is on a large private estate, where a number of gardeners are kept. For comparison we have here the little peasant's cottage in the little town where my mother was born, and very near her old home—a pear tree growing against the end of the house and a grape vine growing under the eaves. The amount of land these people have is extremely limited. Between the house and the front fence is about two and a half feet, but they manage that land to pretty good advantage and get something from it.

Here in the middle of a little village in Silesia we have a garden running along between the sidewalk and the grocery store; growing against the side of the house an apricot tree which bears abundant crops of fruit.

This is an orchard of fruit trees on a private place in one of the suburbs of Berlin. It was photographed early in the spring. The trees have been whitewashed which gives them

that striking appearance. It is rather advantageous from the photographic point of view because it gives us a chance to see just how the tree looks. These trees are old and neglected, by the way, and do not show the nice symmetrical, clean-cut, well-kept forms which you will find on carefully trained trees.

This is another portion of the same place, showing horizontally cordon apple trees. These apple trees will be a foot and a half or two feet from the ground. Now there are great advantages in that. They have the advantage which I spoke of in respect to the trees growing against the side of the brick wall, that they receive the reflected heat from the soil and that they receive during the night a considerable amount of heat taken up by the soil during the day and given back to the fruit during the night. It is much easier to take care of trees eighteen or twenty-four inches high.

This is a little apple tree growing in a little private garden down in Kent in southern England. You will see they vary a great deal, some of the trees being very symmetrical, very fine, and others poor and untidy. Of course a tree in these various forms requires constant care—not merely one pruning once in five years as some of our trees get in Massachusetts, but five prunings every year—looking after all the while.

These trees are peaches, of course under glass, for in England peaches are grown practically only upon walls and under glass. One must have a good deal of faith in horticulture when he can afford to glass over his orchard. As a matter of fact some of these glass houses grow fruit for the market, not so much in England as in Belgium and northern France; but still there are hundreds of acres of them altogether—I don't think I could say thousands, but hundreds of acres in fruit trees in the old country which are grown as a commercial enterprise in glasshouses.

This is a typical tree for use in a glass house. Some of them are bush-formed trees in pots, and some of them are spread out on trellises as you saw them in a former picture. This happens to be a nectarine which is grown in England largely in preference to the peach, and I am unable to understand why it is not more widely grown in America. As one finds them in the old country they are fully as good as peaches and in many ways superior.

This little fig tree reminds us of our forefathers because that is what they started housekeeping with. This one is grown in the greenhouses with the other fruit. In order to show that the small fruit proposition, the small fruit tree, is not necessarily confined to England, I am putting in two or three pictures from a garden which I used to have in Massachusetts. The one in the foreground is still growing but the apple trees have been dug up. They were very attractive and interesting and very satisfactory during their day. I may say they were dug up simply because the ground had to be used for the erection of a new building. These are cordon apple trees, upright, trained against a wire fence. The trees are planted eighteen inches apart and have ample space, and you will see are bearing good crops. Bro. Gould has stated tonight that many of us are making mistakes in planting our apple trees too near together. He thinks they ought not to be closer than thirty-five feet. I don't recommend everybody to put them in at eighteen inches apart, but this picture will show that it can be done, and done successfully.

Here we have another picture from my own garden of a dwarf pear tree. A six-year-old boy beside it will indicate pretty clearly what is the size of the tree, and the crop speaks for itself. This small apple tree bearing four or five first rate good-sized apples had an entire height, we will say, of twenty inches. Now that is a small tree. I believe in heading them low and keeping them under careful attention. However, that is a garden proposition and not an orchard proposition. And while I am speaking about that I might as well say that while I have a good deal of enthusiasm for dwarf fruit trees, and have said something about them, and written about them from time to time, I have never recommended them as a commercial proposition and do not do so at the present time. They are splendidly adapted to the needs of the ordinary city and suburban dweller, the man who finds it a great deal more comfortable to move once in three years than to pay his rent. Now the man in that condition cannot possibly go into fruit growing unless he can have some small trees which he can put in the back yard and bring into bearing in one or two years. He can do that with a dwarf fruit tree and get a lot of fun out of it, and under many circumstances when he has got to move

to another neighborhood he can pull those trees up after dark and take them with him. I know because I have done it and they will go on growing almost as readily as the chickens which you move along at the same time. Here we have currant bushes in the same style of garden, simply to show that when one starts out in that suburban back yard gardening he can do almost anything he pleases.

Now we are back in Europe and find ourselves in the Covent Garden Market which I think is far and away the most interesting fruit market in the world. In some ways it is the largest fruit market in the world—I don't know but it is really the largest in the volume of fruit that it handles; it certainly is the most interesting one in the extent of country from which it draws, for one finds there fruit literally from all parts of the world. He finds the best from all parts of the world because it is a discriminating market, a market which selects well. There are some of the keenest and brightest fruit handlers in the world, men who have correspondents everywhere, in every country, and they know what the fruit markets of the world are, what fruits of every kind are, where they come from. One gets all kinds of information and all kinds of courtesies from these men, and it is extremely interesting. Of course we self-satisfied Yankees see a great many things to criticise. For instance, those baskets piled up in the background, willow baskets, they use for every sort of thing, and they ship everything in them, including strawberries. Strawberries are mostly shipped in quarter bushel baskets made out of willow in that fashion. And moreover, they are returnable baskets, shipped up from Kent to London, berries sold and poured out into the old woman's apron, and then the crate is shipped back to Kent, thrown in the red mud in the early morning, and is packed full of fruit again and shipped back to Covent Garden, and the next day it comes back to Kent again, and so after making about twenty trips and resting in the red mud twenty different mornings, and having the strawberry juice run through twenty different times, you can imagine the sort of package in which the strawberries are distributed in the market in London.

Here is another corner of the market, with the usual things. This place here in Liverpool shows many of the same features



of the ordinary fruit market. It is quite late in the day—it usually is when I get round to anything of that sort—and the market is being cleaned up, but here on the curb throughout the early morning thousands of bushels of fruit are sold and carted off to the local markets of which this picture shows a type. It looks like an ordinary corner grocery, and it is. You see the half-sieves sitting there on the corner from which all kinds of fruit and vegetables are distributed to all kinds of customers—you have them there as you do here.

Now going on to the continent of Europe we find ourselves in the city of Mainz, in a typical continental market of one of the most strikingly beautiful and interesting cities in all Europe. There is nothing more picturesque and from every point of view more interesting than these city markets. Here you see the marketing going on, mostly conducted by women who bring the produce of their own farms into market and sell it there direct to the customers. Now you and I know that the greatest problem we have to face is that of marketing, and the thing we are trying to arouse people to do is to bring the producer up to the consumer, to get the two together, and that is done better in the local markets of Central Europe than anywhere else in the world, and I haven't the slightest doubt in my mind that some of the improvements in the next few years will come in this direction. I am pretty sure that some of the cities in America could support these public markets with very good advantage. I am especially sure of that, not because I have seen it in Germany and France and Switzerland and Austria and Italy, but because I have seen it in America. Lots of things you see over there will not apply in this country. But the open curb market supported by the municipality can be made successful in this country, perhaps not so easily and universally, but certainly it can be made successful. This particular market is the one with which I am best acquainted for I lived six months in this little village and used to go almost every market day, that is two days in the week, Tuesdays and Fridays, to this place and used to buy the things which I needed for supper. I did it because I wanted something for supper and because I wanted to know how this business was handled. It was very interesting. I could spend all this evening telling stories of the way in which things are sold there. I



used to buy a quarter of a pound of butter, or cheese—which was quite enough of some kinds—or a quarter of a pound of sausage and other commodities in like quantities. It is a retail market in the most literal sense of the word.

The flower market here in front of the great city hall in Brussels is simply another example of a retail market. It is beautiful and picturesque.

I thought perhaps this picture would be interesting although it is not one of my own. This shows one of the typical city markets at Sofia in one of the public squares, and this one here shows a market at Cairo, Egypt. These open air markets in public places are almost universal outside of the United States of America. I was going to make an exception of Canada, but in French Canada particularly the open air markets are maintained in a great many places.

Now I am going to leave behind the fruit-growing business and the fruit marketing business for the present because I am personally more interested in other branches of horticulture. I am personally particularly interested in the ornamental phases of agriculture known as landscape gardening, and the old and beautiful gardens of England have been a special delight to me. Here you have an example of one of them. They are characterized by the enormous quantities of flowering plants and of very, very great luxuriance. There is no other country where such quantities of flowers can be grown in such a magnificent and luxuriant manner and no place in the world where such beautiful lawns can be developed. Unfortunately it is not convenient to show the beauty and the luxuriance of a lawn in a photograph, and so in these pictures which we run over we don't have the opportunity to see the lawns as we ought to see them. This picture of the old fashioned bee hives is interesting perhaps, and I ought to say that the bee hives are kept there for ornamental purposes rather than for the growing of bees. In this country we have heard of the rose as the queen of flowers, and many of us suppose that it is so although we have very small demonstration of it in our own gardens. It is not possible to grow roses, in the Eastern States, at any rate, at all as they are grown in England. After one has seen roses in England he is pretty nearly ready to give them up in this country and devote his land to cabbages.

This is a typical garden at the height of summer, with its multitudes of larkspurs, hollyhocks, phlox and other things. You may think there is some hocus-pocus about that because you find a lot of plants there in blossom which here in Maine do not blossom simultaneously, and yet they are pictured here together. But although I did not take that photograph, I think the picture is genuine. We find in England, in the long slow spring and the long slow summer many plants coming on together which here are total strangers. This is a pleasant little valley in rural England,—shows the fine, pleasant, rural scenery. The picture here is particularly interesting to me because it shows an old orchard and a deer park combined right near London. This is about ten miles from London. Now we have tried in Amherst, Massachusetts, to run an apple orchard and a deer pasture combined for a number of years; we do not supply the deer, however, and we do not own them. The State of Massachusetts claim that they own the cattle and we have to support them. We do not like the business and have been trying very hard to keep the deer business and the apple business apart. As a matter of fact, they do not conduct the two together in Europe, but when they have a flock of deer over there they make use of them. They keep them and they are all tagged and numbered like so many Jersey cows and as soon as they mature they go to market. And if the State of Massachusetts would conduct its deer business in that fashion I should think very much more of it than I do at the present time.

This little sketch along one of the pleasant rural paths in England gives a nice idea of the country, one of the pleasantest and most attractive countries in the world for the tourist, and I think also for the one who lives there. These pleasant paths lead about all over the fields and are really public paths so that one may wander about almost where he chooses in the country and not feel he is trespassing anywhere, and come upon all such pleasant, rural bucolic scenes as this where we have the hay stack in the barnyard and all the farm work going on. It is very interesting for a man who has been brought up on a farm and who loves farm life and who likes to stop and talk with the men and women at work in the fields.

This is a pleasant country house in England, a house which has stood for a little over two thousand years, and which as

far as I can see will stand for two thousand years more. It gives one some little idea of the permanence of that country.

And just to show that everything in that country is not as bright and beautiful as some of the photographs, I have also a few pictures of the back yards, some of which look just as they do in this country and make one feel as though he was entirely at home.

A pleasant rural church of this kind is a common scene in England and reminds me that our country churches in New England are, some of them, beautiful, but very few of them are as permanent as this, and some of them, in fact, are very squalid and unsatisfactory. It happens that this particular church is like a good many of our New England country churches, it is entirely deserted except by these good old friends in the foreground who can't get away. A village farmhouse in the same neighborhood is shown here, showing something of the type of rural architecture which is quite familiar, especially on the hills of Gloucester. This is a substantial school building in a little village in Gloucester, showing two or three little items of interest, the closeness and narrowness of the streets, the sharp corners that are turned, the way in which all the little corners of land are used for buildings, and the fine and clean and substantial character of the public buildings themselves. Those people have been there, as I say, for two thousand years and they expect to stay two thousand more, and so they are willing to have things fixed up as they ought to be.

Here we are again back on the continent, for with the collection of these slides around various paragraphic topics, I have looked to the topics rather than to the particular localities in arranging the slides, and am therefore keeping you jumping about from one place to another; but I hope that will not confuse you or cause you any seasickness or discomfort. We can cross the channel in this way without any seasickness, though some people find it difficult to get across in fact without some trouble. We are now in southern Germany, in a very pleasant, beautiful, private garden in the early spring with the magnolias in blossom. The same girls stand for us here in this photograph, showing the same magnolia tree, and a very attractive view down the main street of the garden. You see the pretty

Japanese plum trees, very attractive and beautiful, strong bushes, which will not grow in this country.

Here we are in Dresden at the lilac blooming time. It is one of the fête days of Dresden, for there are thousands of people that go to Dresden every spring simply to have a smell of the spring and see the lilacs in blossom. Here are also the wistarias growing against the side of the house, and we have a typical arrangement of a dwelling-house of the better kind—there are a good many things which I have not time to explain. Here we see the lilac bush at the private house leaning over against the wall, and the pear tree growing against the gable end of the house—there isn't much room, as you will see; wherever there is a foot of land it is made use of, either in fruit trees or useful plants or something which is attractive to the family. This is rather a better house here, with its nice fence and its splendid lilac bush growing against the wall. These arrangements are perfectly practicable in any of our American communities. In American cities we have what we call slums. We are ashamed of them and we try to get rid of them, and we are doing something very slowly and very unsatisfactorily to rid our cities of the slums. I think that on the whole the better cities of Germany and Austria have made more progress than any other cities in the world. The picture which is taken here is in one of the poorer districts of Vienna and shows a little courtyard around which six or eight families live, all opening out into this little square, and yet you see it is a fine, pleasant, attractive place. It has a home-like look and it is greatly enhanced by the fruit trees and vines which are growing there. In every one of these little courtyards you will find some sort of gardening going on.

You and I, however, who like to be in the country, are more interested to walk along the country roads and to view scenes like this. When the fruit trees are in blossom there we find something really more attractive than the set and cultured gardens such as some of those I have been showing you. These wayside views are always attractive. This is one of the suburban gardens of the poor working classes in the neighborhood of Berlin. All about the European cities you will see small gardens of a quarter or an eighth of an acre set apart and rented on long terms of years to workmen of the poorer classes in the



city, and they go out there and work all day Sunday and work in the evening after hours, and very often take their families out there too, put up a shed or two dry goods boxes and live there all summer, in that way getting a touch of rural life, at any rate of out-door life, doing some gardening and fruit-growing. And nothing is more attractive, nothing is more interesting anywhere in the old country than to go and spend a day in one of these little settlements where perhaps four or five hundred families are located. This is something which the ordinary tourist misses altogether, partly because it isn't down in the guidebook and partly because one doesn't get into these places easily. They do not like to be looked over. If one goes there sociably and talks and visits with the people and spends some time in getting acquainted, he finds them very amusing and interesting and the stories one could get would be well worth the entire trip.

Here we are on a large estate in Silesia showing one of the fine old castles with its splendid grounds. It is the estate of Prince Pückler of Moscow who wrote a famous book on landscape gardening. This is his own estate built a little over a hundred years ago on one of the most magnificent stretches of land I ever saw, on which today are developed thousands of beautiful trees planted over a hundred years ago, because he preserved many which were old trees when he went on there, and the trees which he himself planted about a hundred years ago are now full grown beeches and oaks such as we cannot have in our gardens and our yards in this country because we haven't lived long enough yet to accomplish so much.

The beech trees in this picture are a part of the Kaiser's hunting property. The land belongs to him personally. A tract of 640 acres right in the center of this big capital city (Berlin). You will notice the fine rural character. You would think that you were out in the woods there. It is only ten minutes walk from the main streets of the city, and there you are in this splendid woodland. It gives every one the opportunity to get a breath of the fresh out-door air and look at the trees, a chance to remember that there is something else besides streets and buildings.

But speaking of buildings there are some of these in the old country which are very interesting and which teach us really



valuable lessons. The two buildings which we see here are known as the old and new town hall in a little town of southern Germany. The new one, on this side, was built two or three hundred years ago, and the old one long before that. They are both pretty good buildings, and when we remember that the poor people who built these buildings five or six hundred years ago were working for wages of ten cents a day or less, and that out of these meagre incomes they were able to save the money to build such magnificent town halls, it rather puts us to shame that we with our greater wealth and our greater opportunities, and the greater productiveness of our land and labor are not able to do better things in this country. I mention this somewhat freely here in Portland where you have done something splendid, something magnificent in the way of a town hall. There are not many places that have done as well as Portland, and there are very few indeed in this country which can compare with anything in the old country in the way of a town hall.

This is one in a little country town. It shows an old town hall, built many years ago, and still fine and well kept. The one in Hamburg is in a large, modern, prosperous city, but it is a fine building with a nice plaza in front of it which opens out onto a fine water front. The city hall in Dresden is the latest one to be built. It was finished within the last few years and is regarded as the very last word in city halls, a splendid modern building in every respect.

And here is one of the school buildings. We think a great deal of our schools in this country and suppose that they are the greatest in the world, and yet the men who study the school problems tell me without any reserve that the German schools are better than ours, and I can say with great emphasis, having visited a good many of them, that the school buildings are certainly better than ours. This is a typical example of a building I knew very well. This is an example of a girls' school in one of the German cities, and shows the fine type of architecture which one sees over there in the public school buildings. Here is a public building which has always interested me a great deal. It might be an art gallery, but as a matter of fact it is a department store, a splendid department store in the center of Berlin. It might be out in the country,

from the looks of the picture, a pleasant, roomy, attractive place, and yet it is in the busiest part of the city of Berlin, and in front of the building there pass two hundred thousand people a day. Now that is a good deal of traffic to pass along one street. There is some business going on there. It shows, however, from our point of view that a little open space in a city with a tree or two and a strip of grass are well worth while.

Another public building which is somewhat unique is a public theatre. I believe there are two in the United States. One of them is in the neighboring town of Northampton which owns its own theatre and controls it and manages it in the interest of the public. These public theatres are common in Germany. Performances are given frequently. This is one of the least of them in a country town—a very attractive public building. And this is a post office. Of all the public buildings the one which comes nearest to the average man is the post office. This is one of the thirty-six post offices in Berlin. This is one in one of the small suburbs, where I used to live and used to go frequently to mail packages. It is interesting to me on a great many accounts. That looks like a good deal of a building—we see only one end of it here—and to imagine that there are thirty-six of them in Berlin would indicate that they put a good deal of money into public buildings. But their post office department does some business. It handles all the telephone business—not very well; it handles all the telegraphic business, most admirably, and it handles all the stuff which in this country we call the express business but which over there is the parcels post,—a real, genuine, honest parcels post. It used to be interesting to me to go over and see all those packages of every sort of thing, butter, sausage, live geese and one thing and another, coming in there to be mailed. Why, if a man has a yellow dog he wants to get rid of, what he does is to take it down there, write an address on a tag, tie it on the dog's tail, address it to some one, put a stamp on the dog's back and send it along. I had some experiences with this parcels post which interested me. I collected some apples to send to my friend Professor Sears, in Amherst, and I had them packed in a box weighing four or five pounds which I knew could not have got into the mails in the United States unless it was inserted from the outside. It was not mailable here, but it had

to be intruded from across the water. I put the stamps on it and mailed it to Professor Sears and he got it and ate the apples. I counted up what it had cost me and the postage on that box of apples, entirely unmailable in this country, from Berlin to Massachusetts was just a trifle less than half it would cost to send it from Portland to Old Orchard, supposing I could have mailed it in this country. Now that was a lesson to me along with a good many others, and I made up my mind that I would not vote for anybody in this country who would not vote for parcels post. I could tell stories all night about the parcels post. It is an interesting theme.

In the old country they have taken up very seriously the questions of beautifying their streets, and one problem which they have solved is that of taking care of their water fronts. I am told that there is a problem in Portland of taking care of the water front, and while I have not looked the situation over I am not afraid to make a guess that there are not many miles of the Portland water front that look as well as this little strip of Hamburg I showed you a moment ago. The city hall is at the left corner here fronting out upon this beautiful square of water. We see it here in its narrowest dimension where this magnificent plaza sets out into it. Here is a fine boulevard. The great department stores are located at the left. On this side are the big hotels of the city. Here are the finest and biggest offices in the city. This used to be simply an old tide flat. Here we have a flowing stream, a little narrow stream running through a country town in Central Germany. You know how they look up here in Maine with saw-mills and slab dumps and things of that sort along the sides. In this case the banks have all been cleaned up, used for the best buildings, and they have been ornamented with double rows of trees, made into fine promenades. Let us take a nearer look. Here is a nice public music hall in the center, a nice friendly beer garden at the right, with trees growing along both sides, pleasant, clean, sanitary, attractive, ornamental, making all the property fronting on this river ten times more valuable than it could be if that river was treated in the manner we treat our streams as they run through our American villages and cities. Even here in the country there is no such treatment of the trees as we are liable to see. This is a pleasant little German country village with its one

winding street and a pleasant stream back of it; altogether a fine, clean, wholesome neighborhood to live in. And this view is taken from the old factory of Nuremberg. There is the bridge. This canal which runs here turns the wheels of industry, as we say. You may think that factories necessarily mean a lot of waste and rubbish and squalor and dirt, but they don't in any country which is cleaned up and cleaned up to stay. This is a water front view also, where a little stream runs through a pleasant English village. It also used to be a sewer, but it has been cleaned up and is now as nice and attractive as any place you could imagine.

This view shows some of the fruit growing and farming interests in Central Germany, near Berlin. This is a cherry orchard at blossoming time. This shows the terraced banks on the hills upon which the vineyards grow, terraced up with stone walls to hold in a little patch of land and then the vines are grown there. The fields of Germany and Central Europe are always picturesque and interesting. I have referred before to the wide recognition of woman's rights in the old country, for one finds them there always in the harvest fields, early and late, working with the men, even doing more work than the men, perhaps, because they are more industrious.

Here we have the fields of northern Germany on the flat low land at the harvest time, and I would like to have you notice what a splendid heavy growth of grain there is. I have one or two other pictures which show that growth of grain. Look, for instance, at this on the line next to Denmark. There is a crop of rye that a man might be proud of. Notice how the land is farmed up to the very eaves of the building. There is a place where people have been farming for five hundred years and the land growing richer all the time. That is agriculture on a permanent basis, and agriculture which is sure of itself and understands what it is doing. And here we see agriculture crowding up not merely to the eaves of the houses but crowding up to the foot of the mountains. Here are the snows in the upper mountains, and below them are the fields, some of them in grain and further back in forests, but all of them busy, all of them doing something, all of them bringing in a revenue. Notice here as we get near to the mountain we have those fine forest lands running up there. That is all public forest, all carefully managed, all bringing in a good solid revenue. They



cannot afford to let any piece of land loaf over there, or anybody loaf over there. These public forests are extremely interesting to everybody. You have heard, of course, always about these public forests, but one of the things that has impressed me is not so much the technical management of the forest as the political aspect of the thing. The forests are owned by the towns in which they exist. The little town in which my mother was born and which I have visited has several hundred acres of public forest. It is managed by a professional forester, and the crop is cut whenever it is matured, and what we call the waste here, the rubbish or brush is taken out, wrapped up into bundles and is distributed pro rata through the town, and the lumber is sold and the proceeds are returned to the town, and there is money enough brought in from the public forest owned by the town to pay all the town's bills, every cent of running expenses, the care of their roads, the care of their schools, and even the salary of their preacher who gets a good salary from the town, the best salary in the town. There are not any town taxes at all. Here in this country we say a man can escape anything but death and taxes; in that country he can escape taxes, and he only dies once. There are towns in that country, they tell me, where from the thrifty management of their own property they not only pay all their running expenses, but they have money left over and on the first day of January they distribute \$10 apiece to every man, woman and child in the place, making him a present for living there. I don't know any place in this country where they are liable to do that. We do not manage towns and cities that way. It looks like good business. I know there are a good many thousands of acres of land in Maine, as there are in Massachusetts, which could be put to work if we had the brains to do it and if we had the political integrity and the political efficiency to manage those things as public enterprises in the way they are managed in the old country.

Now friends, I have covered the trip as far as I expected to go. I have taken these various ideas from various parts of the country, not in a very connected manner, but I hope some of them have interested you and I hope some of them seem to have some bearing or other upon our problems here in Maine and in New England.

I thank you for your kind attention.



## WEDNESDAY FORENOON.

## PRESIDENT'S ADDRESS.

MR. HOWARD L. KEYSER, Greene, Maine.

On behalf of the officers and members of this society I wish to express our thanks to the citizens of Portland, who, by their efforts and generosity have made this meeting of the Maine State Pomological Society the largest in its history and thereby stimulated increased interest in the pomological work in the State.

We are pleased and proud to have with us as our guests at this meeting, the officers of the New England Fruit Show as well as many leading orchardists of New England and glad they are exhibiting fruit in competition with our own—made possible by the hearty coöperation of the Portland Board of Trade.

On every hand is the evidence of the awakening of hundreds of fruit growers to the questions of the hour,—the best and most practical methods for the improvement of general conditions.

Where a few years ago the orchardist who sprayed was not considered quite sane, he is now sought by his neighbors for information, and the small amount of knowledge possessed by many growers notwithstanding all the publications, bulletins and various educational meetings, illustrates the fact that a very large per cent remain in the primary class and a great work still remains for such societies as ours.

Since our last meeting the season of 1911 has passed into history and we have again harvested a bountiful crop of fruit, the culture of which I am going to leave for discussion to the many able authorities we have with us, and, in a brief way, speak of some of the ills we have with us on the business side.

The fruit crop of the state of Oregon was placed at 1,100,000 boxes for 1911 for which was received \$1,094,000, not quite one dollar net per box. I am not quite visionary enough to grasp

the figures of the speaker who figures that Washington, Oregon, Idaho, and Montana have 19,500,000 boxes planted and growing and by 1915 will produce 97,500 cars of fruit, equal to 3900 trains of twenty-five cars each, or the dispatching of seventy-eight trains a day for fifty days. But I do say to our fellow fruit growers of the East, it is time for Rip Van Winkle to arouse. They do things on a large scale in the West and if we remain dormant, they can and will take our markets. If we awake to the new ways and methods, we have all in our favor,—cheaper lands, nearby markets, less cost of production. They are averaging three dollars a barrel for their best fruit, with no market for seconds. The same prices to us, owing to our advantages, would mean five to six dollars per barrel and markets for cheaper grades. What is the reason for this vast discrepancy? Coöperation. Does it need any more convincing argument? How much longer shall we talk and argue, while the other produces and sells?

No doubt there are many present who recall the time New England produced her own corn, wheat, etc., but now she purchases in the West. Are you going to permit history to repeat the story and purchase your fruit? I am not an alarmist, but you must not overlook the fact that in another year the Panama canal will be open to traffic. At the same time our European apple market will open to our western competitors and unless all signs fail they will land fruit at foreign parts at thirty-five cents per box. Under our present methods of production and packing how long can we hope to control these markets? To dominate them we must use the progressive culture, grading, packing, and marketing methods of our competitors,—the Pacific coast orchardists.

During the past year, I have received numerous complaints through our new foreign consuls of our careless pack, and I regret to say most of them mention New England States in particular. It is time to "stop, look and listen," the locomotive and cars are coming.

I was very much impressed at our last meeting with the address of a former secretary of this society on the want of proper storage facilities. This, at present, is one of the greatest crying needs of the fruit growers of this State. Thousands of barrels of apples pass annually into the hands of speculators

simply because of lack of facilities for storing. To my mind, cold storage and coöperation go hand in hand. When we solve the former, the latter will follow, enabling us to avoid the fall rush of fruit to glutted markets and make a more equal distribution at all seasons, and insuring a larger profit to the grower without adding any hardships to the consumer.

I was approached a short time back, as to the feasibility of the erection of a cold storage warehouse in the fruit belt. It did not, however, in this particular case, appeal strongly to me, as the capital would come from out of the State entirely, while I firmly believe it should and could be raised here among our citizens, who have the welfare of their own State more at heart. This proposition, however, illustrates the fact that if we do not take the initiative, the opportunity will be lost and I recommend the appointment of a committee of this society with power to act if sufficient capital can be procured. To accomplish anything a beginning must be made.

Four years ago at the earnest solicitation of this society, the legislature passed the Maine apple law, without any appropriation to secure its enforcement. We are all too familiar with the present conditions, which seem nearly a calamity to those who are doing their utmost to make our apples known not as the "big red apple" but the "best red apple." There are a number of sections of the law which are open to criticism and for the purpose of discussion and that the sense of this meeting may be laid before our next legislature, I recommend the following changes:—Omit after Sections 2, 3, 4, "Any package, barrel or box of apples containing more than ten per cent of apples below this standard shall not be marked, etc."

The success of our western competitors is in their honest package, not superior quality.

This is the age of progress; we must keep in the procession or be spectators. This will work no hardships except on such parties as pack 106 barrels of fruit in six hours with a crew of five men, as was done in the town of Monmouth last winter. Let us be honest and pack our goods true to label, leaving the tolerance to the court or proper authorities.

If our present law was enforced we could not secure a conviction under a tolerance of fifteen or sixteen per cent. Surely five or six per cent is sufficient. This, I am informed, has been

the usual custom in all pure food decisions, relating to protein.

When the apple buyers of the world understand that the word Maine means just what the label reads, the results will surprise the opposition to this change. Try and be convinced.

Your presiding officer has made his stencil bring a premium price, and surely what a few can do many can accomplish with much better and quicker results. The world's greatest trust, the Standard Oil, has been accused of watered stock, but we never heard that they watered their oil.

Let us also recommend a change in size of our apple box to 18x11 1-2x10 1-2 owing to the simplicity with which it can be packed in comparison with our present standard, and also for the sum of two thousand dollars for the enforcement of chapter 247 of the public laws of 1909. In this connection I have heard the argument advanced, that more can be accomplished by education, than by statute; that you cannot prevent a dishonest pack by law. Possibly not entirely, but we can control it. You cannot prevent murder by statute, but how many of this audience would repeal the laws relative to murder for this reason?

At the same time I believe in education along packing lines and our State Department of Agriculture has offered to give box packing demonstrations in the orchards, upon request.

I do not know how many have availed themselves of this offer, but coming at the busy season, I fear but few. Such demonstrations given in the granges during the winter months, would no doubt be well attended and do much to improve general conditions. Of one thing we can rest assured, the apple box for fancy fruit has come to stay.

A story is in circulation so absurd that it may seem foolish to refer to it here and I would not except for the fact that it is so persistent in its circulation and it has come to me from so many sources. I want it distinctly understood (and I am quite sure I voice the sentiments of every grower present) that there never has been and never will be on the part of this society any effort to prevent the sale of *any* grade of apples grown in this State. All we are fighting for is that they should be so graded and marked as to truly represent the stencil. The farmers who listen to the doleful tale of some apple buyers,



that they will not be able to sell their number two apples, if this law is enforced, can rest easy that there is a market for their fruit, but if they persist in growing number two grade it must be sold as number two and not as fancy. At Augusta last year we had a good sample of a fancy pack of one of our prominent buyers. The man who circulates such a story among a class of growers who do not understand that the apple law is intended as an uplift to the industry, certainly is no credit to that industry, his state, or nation, in trying to create the prejudice that he may still continue his dishonest methods.

Our society has made such rapid growth in the past few years that it is impossible with our present funds, to keep up the past high standard of our meetings and perform all the various committee work without assistance from the cities we visit, and while it has been freely given in the past, it places your officers in an unenviable position and bars us from visiting some places where the fruit industry would be much benefited. I therefore suggest requesting the legislature to increase our stipend to two thousand dollars. I am firmly convinced in making this suggestion that standing committees of this society can in time rectify many existing evils. As an illustration look at the tremendous increase in ocean freights on apples in the last few years, an increase worse than injustice.

Look at the arbitrary rates of the M. C. R. R. on the so-called "freezer" cars, a special rate of three dollars per car to Portland and five dollars to Boston on apples, while cream and other commodities are carried at regular tariff rates. We surely are not making an unreasonable request and in a State where the fruit industry is so important, the State should give freely to assist such work in every legitimate channel.

Your officers had hoped at this meeting to be able to set a standard of sizes to assist the judges in awarding prizes, and while we have procured much valuable data, we did not feel that we had sufficient to add to our rules and rather than commit an exhibitor to an injustice, preferred deferring same for further consideration.

A very large per cent of the fruit raised at Highmoor Farm is Ben Davis and it certainly, as a rule, is not a good business proposition to dispose of them early in the season. Here the storage question is again a serious matter and our member of



the Station Council has requested me to call your attention to it, with the request that we endorse their action in asking for an appropriation of five thousand dollars from the State for the erection of a cold storage plant to be used also for experimental work.

This society has accomplished a great work in the past for the fruit growers of this State, and it has always seemed strange to me that its membership has not increased in proportion. I am inclined to believe that we have not been active enough in extending invitations to our fellow fruit growers to join us. At our field meeting at Highmoor Farm, an appeal I made was met with a ready response and believing there will be a great many visitors with us here, who would be glad to join our ranks, if given a personal invitation, I would like to see a special committee appointed at this meeting to solicit members.

Since we met together last, God, in His infinite wisdom, has seen fit to remove from our midst one of those noble characters which are only too rare, one who not only crowned his own personal work with success, but gave freely of his time to his fellow farmers, to this society and to his State. We have lost a member of sterling worth of character and mind. Such a man was our ex-president of this society, the Hon. Z. A. Gilbert of Greene.

## ADDRESS: LIFE, HABITS AND DEVELOPMENT OF THE HONEY BEE.

By DR. JAMES P. PORTER, Worcester, Mass.

*Mr. President, ladies and gentlemen and fellow scholars:*

I have here on the screen the representation of a cucumber. Every year in the State of Massachusetts the cucumber growers use one thousand colonies of bees. They use them in order to make sure that their cucumber vines produce cucumbers. As many of you know, the cucumber is peculiar, the male flower being on one plant and the female flower on another plant. Now in order that the cucumber vine produce cucumbers the grower, before he made use of the bee, would take a little brush and go from one plant to another and carry the dust or the pollen that is grown on one plant and put it on another. Unless that is done the cucumbers which grow in the greenhouses will not produce, so the cucumber grower has found that each season he must bring to his greenhouse a colony of bees and allow those bees to fly inside. They go from one blossom to another and fertilize those cucumbers, and thus he is enabled to produce a crop. We see then that there is direct use for the honey bee in the fertilization of the cucumber plant. Now I want to show you something of the life and the habits of the honey bee, and above all to show you the relation of the bee to the work of the apple grower.

This slide represents the different parts of the blossoms of plants. One part of the plant produces the pollen or the yellow dust which you find on the apple blossom and on the blossoms of many other plants. Another part when a grain of pollen falls on it is fertilized. The grain of pollen passes down through a tube, and therefore this plant will produce seed. Darwin, working nearly a hundred years ago, found that a great many of our plants will not produce seeds unless they are properly fertilized and properly pollenized. That means that the pollen from one plant must be carried to another, or, in other words,

we must have cross fertilization. If we do not have cross fertilization very soon we shall have too close inbreeding and the plants will deteriorate, and the apples grown on apple trees of course will become poorer and poorer.

You can see that as the bee flies from one blossom to another blossom he has some dust on his body and as he alights he fertilizes the plants. Therefore the bee is most useful in this process of cross-fertilization. Darwin is responsible for the statement that nature abhors self-fertilization; that is, that we must have some method of cross fertilization.

This picture shows the worker bee, the bee in the hive which does all the work or most of it. Here we have the queen bee. The queen bee can best be described by this phrase,—that she is an egg-laying machine, and more of that I will show you later. Here we have the drone which exists for the purpose of fertilizing the female and for no other purpose. In this cell you see the egg as laid by the queen bee. Now that egg is carefully cared for and it is fed by the worker bee inside the hive. We may never understand the honey bee until we know from whence it has come. Flying around among our flowers and fertilizing them are a great many other bees in addition to the honey bee, and these are the bees from which the honey bee has developed. I show you here a little bee which digs a hole in the ground. That hole is lined, pollen and nectar are put in the bottom of the hole, the egg is laid which you can see on top of the nectar and pollen, the hole is closed up, and the little bee goes away and allows that egg to hatch and feed on the food stored there, and after a little while the little bee flies out and gathers nectar and pollen just as the mother bee has done. You see that the bee has dug the hole in the ground, but now runs it horizontally after it has entered the ground a little ways. It lines this hole with leaves cut from the rose. After a while this little bee hatches and grows into a bee and digs its way out and goes the way of the mother bee. This slide will show you the bee flying over toward the entrance of that hole in the ground. Here we have several nests, all with a common entrance, and that suggests the beginning of social life in bees. Here we find by digging down into the ground several females, in there together, and there again we have the first example of bees living together.

This shows you a little bee which searches out a snail shell and uses that as a nest. It does not go to the trouble of digging a hole in the ground. It lays its eggs in the different turns of the snail shell, and then covers the shell with pine needles and bits of straw to protect it from other insects.

Here we have a very interesting condition of things because we have several cells instead of one. This mother bee lives until she sees the young hatch and grow, and this is said to be the first example in bee development of real contact of mother and child, and it forms an important step in the development of the honey bee.

Here is a very interesting thing. The nest which I have just shown you, with several cells, belongs here. That is placed in the ground, being reached by a tunnel down below. That tunnel does not end with this nest. It goes on below. We have been set to thinking, trying to reason out why that hole went on below. Some say it is for the purpose of allowing the bee, when danger threatens, to run below. Not so, I believe. That hole below the nest proper is for the purpose of draining the nest of water and keeping it dry, and so we must with our honey bees at all times keep them free from moisture. In fact, the reason so many of them die during the winter is that they become covered with moisture.

Here we have a bumblebee's nest. You know that at one time the growing of red clover was introduced in Australia but it was found that from the clover grown in Australia seed could not be produced. What was the reason? The reason was this, —that they had no insect to fertilize the clover. Along with the clover they had to import the bumblebee, and after that was done they had no further trouble in growing seed from their clover. That shows you that the bumblebee is a most valuable insect. It ought to be cared for much more than it is. And indeed, we ought in this country to begin to develop a honey bee with a long tongue which could do the same work as the bumblebee now does. I want to tell you a very interesting story about the bumblebee. If you visit the nest of the bumblebee early in the morning you will find that above that nest, which is mound-like above the ground, along about daylight there appears a large bee, as it were on the roof of the house, and he begins to fan his wings rapidly and make a buz-

zing noise. What is that for? It has been found that if you remove him from the top of the nest another one will take his place. The first explanation was that the reason he appears there is to wake up the rest in the morning. We know, of course, that with us it requires one member of the family, usually, to wake the rest up in the morning. That was thought to be true of the bumblebee, but it is not the case. The real explanation seems to be that those bumblebees coming back at night loaded with food from clover and other plants and lying there in the nest all night make the air impure so that the nest needs ventilation, and the first thing in the morning it is the business of the largest bees to mount to the top of the nest and fan their wings and get air currents so that the nest will be ventilated. The same thing takes place all the time in the honey bee hive. Ventilation is carried on by the bees fanning their wings.

We have here a very interesting bee, not a native of this country, but you see the life is much more complex. This comb is made to hang from a branch of a tree. Above you have the cells made for the storing of honey, below you have the cells made for the workers, in which the workers grow and develop, and finally come out and do the work of the colony; you have the large drone cells, much larger than the others, and at the bottom you have the large queen cells. I can tell you a very interesting thing about the honey bee. Just as soon as the workers find they have no queen in the hive they set about to produce a queen. How do they do that? They build one of these large cells from a small worker's cell, they begin to feed that young bee inside, wormlike now in form, a peculiar kind of food called royal jelly and they soon develop there a queen bee simply by feeding this young a different kind of food. You will notice of course that the queen cell is a good deal thicker and heavier. That is to protect her from the cold. The temperature must be kept constant in this hive.

This shows you the real honey bee hanging as the one shown before. It has been found that bees will live out-of-doors. They do not have to have hives in which to live, and indeed they can pass through the winter, a very cold winter, hanging out of doors with no protection whatever. Formerly of course they lived out of doors. A little later they lived in the trees



in the forest, and since we domesticated them they live in the hives which we make for them.

This is a very interesting section from a bee hive. You see here a great brood of worker cells and along here a great row of queen cells. We have found that after we have had a hive of bees two or three years the queen wears out. She gets old, she cannot lay eggs as rapidly as she did once, so we have to take out the old queen and put in a new one. For this reason we have men who make it their chief business to grow queens. They cut out these queen cells, put them up to the top of the hive where the temperature is constant, and move them along gradually, and then these little bees feed them royal jelly. They take them out gradually and sometimes they can produce as many as three hundred queens in one season from a single hive. You will see that the comb cells are larger for the drones than for the workers. Here you have drone cells used for the storage of honey. That recalls to my mind a very interesting story. It is found by bee-keepers that when bees lack room in the hive they store the honey in the drone cells; these being larger hold more honey, and it is said that the bees reason that out and show wisdom thereby. But such is not the case. They use these larger drone cells for the simple reason that you, when you are in a crowd and excited, will do things which you would not do when you are alone or when you are with the members of your family; that is, they fall back on some old way of doing. Here you have the queen cells shown in their characteristic grouping. It has been found that the queen bees need to be cared for every moment by the worker bees. And so you see the queen bee in the center, larger than the worker bees and surrounded by them. They follow every movement she makes. They go wherever she goes. They guard, protect and keep her clean. Of course she is wandering over the cells here, laying eggs in them. How does she know when to lay an egg which will produce a drone and when to lay an egg which will produce a worker? Well, I don't think she knows very much about it. She lays an egg which will produce a drone, which is a fertilized egg, she lays an egg which will produce a worker, when she comes to a cell of a certain size, and I think that is all there is about it. She is an egg-laying machine in the truest sense of the word.

The next slide will show you something about the ant. You know among the trees, in the grass, all through the soil, we have ants everywhere, and sometimes they give us no little trouble. Now the queen ant is very different from the queen bee. After she mates with the male she drops to the ground, searches out some spot which is protected, some hole in the ground—lays the eggs, takes care of them, takes care of the young after they hatch and until they are grown, and then they take care of her. You see a condition of things very different from that of the queen bee who has to be cared for at every step. The queen ant is in no sense a laying machine, or not at all in the same way as the queen bee.

Here you can see very clearly the different stages in the growth of the bee,—the development of the bee from the egg to the adult. Now you know that in the hive when one queen hatches she rules the colony. She goes about over the cells and if there are other queens about to hatch she stings them unless she is prevented from doing it. That means you have a community here which must be ruled over by one queen and one queen only.

Here we have the brain and the nervous system of the bee. Up at the top you see the little bunch of nervous matter which enables the bee to do all the work which it does,—most wonderful little mass of matter in the world.

I wish you would pay particular attention to this picture. Here we have the brain of the drone. I want you to notice how narrow it is and thin. He doesn't do much. He exists only for the purpose of mating with the queen and that does not require much brains. Here is the brain of the queen and you notice how much thicker it is than the brain of the drone. At the top you have the brain of the worker, and you know that the worker bee does nearly all the work in the hive, all but the laying of eggs, and sometimes that, although its eggs produce males. You can find nowhere, so far as I know, a more interesting and more significant set of figures than these. For we find when we examine the brain of man, the brain of adult man, the brain of the feeble-minded man, the same condition as we find here between the worker bee, the queen bee and the drone bee. The feeble-minded child has a brain which is something like this, very small and little developed. Another

interesting point. Notice the size of this nerve which runs to the eye in the male. Notice the size of the nerve which runs to the eye in the queen, which is smaller, and notice the size of the nerve which runs to the eye in the worker, which is still smaller. The nerve in the male is large because the male has but one use for his eye in his whole lifetime and that is to follow the queen in her flight and mate with her, so he must have keen vision. The same thing can be said of the nerves which run to the feelers or antennae, those parts of the bee which allow him to find out about the objects which he meets by feeling of them and smelling of them. The nerve in the male is large, in the female is large, in the worker small. That is, the worker in order to do all of its work does not need to have so keen a sense of smell as the male in order that he may in connection with his sight follow the female and thus mate with her. Up here you have the face of the bee shown. In the middle you see these three small dots. Those are the three small eyes; on the sides you see those great prominences, which are the compound eyes. They exist on many birds. The small eyes of course see objects near by. The large eyes see objects farther away, but in a blurred sort of way, not clear as our eyes see. You also see the feelers or the bee's nose. Now imagine, if you please, if you had a nose as long as your arm and could move it about, what could you do with it. Well, you could feel out blossoms, plants that have fragrance, and of course you could get your food from them, and that is just precisely what the bee does. It has keen sense of smell because that nose is all covered with fine hollows and it goes to the plants that are fragrant. I spoke a while ago of the desirability of having bees with a long tongue. European peoples accuse us in this country of not caring anything about the kind of bees which we breed. We don't care what breed of bees we have. We don't spend much time and knowledge in getting a fine breed of bees or in developing good stock. We take what we can get. If we could develop a bee with a long tongue, that bee would be much more useful to us in the pollenization of our plants. It is said that the honey, bees' wax, etc., produced in the United States are worth annually \$20,000,000. It is also said that the value of the bee to the apple grower

and the florist is certainly five times as much annually, that is, \$100,000,000.

Here we have shown a bee hive, the entrance to which leads into a greenhouse where cucumbers are grown. It is much better, of course, to have two entrances to the hive, one leading to the outside and one to the inside, otherwise you will find that you lose your hive of bees too soon. That is, the bees will go to the inside, beat their wings against the glass and so many are killed that you have to replace them with a new hive. Here we have the entrance to one of our hives shown. These are the sentinel bees. Now, as you all know, each bee in the hive has something definite to do. They are the sentinels that guard the entrance. There are those who take care of the ventilation and they are stationed here also, fanning their wings to make currents of air. We see the nurses who take care of the young bees, the worker bees who go out after pollen, the worker bees who go out after nectar, and the bees that take care of the queen; also the bees that clean the hive, keep it perfectly clean. There are the bees that stop up the holes with wax. It is found that these bees remain a certain distance apart. If you remove one the rest will change their position to take care of so much entrance, for often robber bees come to the hive. There are always people that want to get something for nothing and they want to steal it from somebody else. To prevent these robber bees all we have to do is to narrow this entrance down instead of allowing it to reach clear across the hive. We thus can prevent the robber bees from coming in, helping thus the sentinel bees with their work by making this entrance say an inch and a half wide instead of the length of the whole hive.

We have near Worcester, Massachusetts, a man who makes a striking success of growing cantaloupes. He has done this for years. He is an excellent bee-keeper also, and I think one explanation of his success is the fact that he cares so well for his bees and that he keeps enough of them so that they fertilize his melons for him. The melon is like the cucumber, different sexes on different plants, male sex on one plant, female on another and cross fertilization must take place.

This slide shows the kitchen pea. All of you know it. You can be certain that any plant that has a blossom which is very



much modified, as this one is, takes especial pains—unconsciously, of course, to attract the bee. The bee flies to this blossom, alights on the wings and another part is lifted up and touches the bee on the breast. The bee in leaving this blossom gets the pollen. Thus we have cross pollenization in the kitchen pea, and without that we should find the seed of the kitchen pea would deteriorate.

Here we have another plant which is most interesting. It is so constructed that, when the bee lights on the flower a portion is made to come down and strike the bee on the back, thus scattering pollen grains all over the back of the bee. Now when that bee visits another flower later in the season it finds the female part developed and what happens is that the dust covered part of the bee comes in contact with the female part of the flower and the flower is cross-fertilized. There you have a flower so developed that the weight of the bee figures in cross-fertilization.

Here we have a still more interesting condition of things, and it was this plant, one of the orchids, which Darwin studied so much. He found that when the bee alighted it touched a spring which let loose the pollen baskets, and they stuck fast to the head of the bee. First they stood upright, then they bent over a little as they hung fast to the head of the bee, later they bent over so that they hung at right angles to the head of the bee. Now the bee visits another flower. What is the first thing to happen? As he visits another flower this bunch of pollen which sticks out touches the female part of the flower and you have cross-fertilization. It seems to me that a thing like that proves beyond question that the plants have evolved or developed or grown along with the insects and that the one cannot do without the other. The bee visits the plant for nectar, for food, for pollen. The plant must have the visit of the bee in order to be cross-fertilized.

Here we have a picture of bee hives as they keep them in New Mexico. We see that they have an orchid also, and it is also a fact that they grow a kind of clover. These three things go hand in hand, one depending on the other. The orchid is cross-fertilized by the bees, and so is the clover. The bees get nectar and pollen from the blossom.



We find that when we start out to test the bee's color vision we have to take very careful pains. We make artificial flowers, bachelors' buttons, for instance, and we find that bees will go to these flowers although they are covered by glass. We find we can get the bees to go to artificial flowers as well as to natural flowers, thus proving beyond question that plants have their beautiful color in order to attract bees, so that cross fertilization may be accomplished. The raspberry is very dependent upon the bee for cross fertilization. We find that when we make an artificial raspberry blossom the bees come to it as often as they do to the natural flower.

This shows a section of the apple blossom. It is proven that if you go out in the orchard and collect say two hundred apples fallen from the tree, you will find that all but eight or ten have fallen because they have not been cross-fertilized. What happens when a bee revisits the same blossom? He fertilizes every part of the apple blossom. Now this apple is a poor one, that is, it is not developed on one side; it remains undeveloped because the bees have done their work imperfectly. They do it imperfectly because there are not enough present. Therefore apple growers should keep bees also. The bees do their work imperfectly because weather conditions will not allow them to come out in the spring. If you have a period of damp cold weather when bees don't fly, you will find that many of your apple trees have apples falling from them when the apples are small. Now the reason for that is that the bees don't fly out in such weather. We should have the bees right near the trees then.

This is my last slide and I want to call your attention especially to this one thing. Apple growers, be very careful when you spray the apple trees. A bee-keeper who is near by has a perfect right to complain in the strongest language if you spray the trees while the trees are in blossom. It is not necessary and many states have laws against it, and we should have. There is no necessity for it. Spraying will do just as much good before or after the blossoming season, and you will not kill your neighbor's bees, or your own. They will do you much more good than any amount of spraying at that time.

WEDNESDAY AFTERNOON.

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## THE VARIETAL ADAPTABILITY PROBLEM AND ITS BEARING ON COMMERCIAL ORCHARDING.

By H. P. GOULD, Pomologist, U. S. Department of Agriculture.  
*Members of the Maine State Pomological Society, Ladies and  
Gentlemen:*

I do not presume that it is necessary for me to offer any defense of the subject which is presented for discussion at this time. It may be said in passing, however, that it was suggested, in substance at least, in a letter which I received some weeks ago from the President of your society. This, indeed, furnished me with an adequate topic for it was quite in line with much of my thinking in connection with my work in the Department of Agriculture.

If there is any consistency in the way in which my subject is worded, as it appears on your program, it implies that there is a problem in connection with the adaptability of varieties; it likewise implies that the problem has some bearing on commercial orcharding. We want to find out just what that problem is if we can, and what its solution is. If it bears some relation to success in commercial orcharding, it is important that we know it.

Now, at the outset, the fact ought to be very clearly in mind that a variety is not a definite and fixed thing. A variety as it develops in an orchard in Maine, or in Pennsylvania; in Virginia, or in Georgia; in Missouri, or in Oregon, is the product of the conditions under which it has grown. As the environment varies so the results vary, as manifested in the behavior of different fruits and of different varieties.

But not all varieties respond in the same way or in the same degree to the same or similar influences. For instance, your most extensively grown variety, the Baldwin, decreases in value the farther south it is grown. I have seen it in many

orchards in Virginia, where it was planted in an earlier day when it was assumed that because it was good in one place it would of necessity be equally good in all places. While it still retains many of the unmistakable Baldwin characteristics when grown in Virginia and other southern sections, it becomes a very inferior and all but worthless fall apple, except possibly when produced at some of the highest elevations in the mountains. Similarly the Northern Spy at southern points becomes a fall variety—a *fall* variety in more ways than one—because the fruit nearly all falls to the ground before it is ripe, and whether it drops or not the most of it rots before maturity; and further, it lacks the crispness and flavor characteristic of this variety when it is grown under favorable conditions. Again, the Yellow Bellflower, which is familiar to most of you, is usually marketed in August when grown in the Ozark region, as it is in considerable quantities, but little does an Ozark-grown Yellow Bellflower resemble the well grown Yellow Bellflower of the northern orchards. In the Ozarks, it has a pale lemon-yellow color and a sharp, cutting, acid flavor with the peculiar characteristic Yellow Bellflower flavor entirely wanting. And the Winesap, which is to many apple districts in the middle latitudes about what the Baldwin is to the northern districts becomes, when grown in “Baldwin country” what a typical Virginian would call a “very sorry apple,” being small, tough in texture and very poorly finished.

A single example will suffice to call attention to the fact that not all varieties respond in the same degree to the influence of conditions. The White Pippin, a variety which I think is not uncommon in Maine, is widely distributed though not extensively grown in any region so far as I know; but I have seen it in the South, in Missouri, in Kansas, and in other widely separated points. The strange thing about it is that it shows so little variation in all these different regions. While there is a difference in its keeping quality, so far as flavor, texture, external markings, etc., are concerned, a White Pippin grown in Maine is not materially different from one grown in the South, in Missouri or elsewhere, so far as my observation goes.

And so we might go on indefinitely multiplying such examples to show how a variety is the product of the conditions under which it develops. In passing, it may not be without

some interest to state that of all the factors of environment which influence the behavior of varieties, doubtless the climate, in its complexity, is the most potent of all. I wish we knew more about it but until we do, it is probably safe to assume that in the climate factor, heat and moisture constitute, in their extremes, their distribution and their sum-total, the most important elements which determine the behavior of varieties, granting, of course, that other conditions do not preclude the possibility of growing any variety of the species. If for instance the soil of a particular site is so water-logged because of poor drainage that it is impossible to grow an apple tree of any variety, all climatic factors obviously cease to operate as normal limiting or modifying influences.

Now if the Baldwin and the Northern Spy, referring to them merely as examples, are good in the North and worthless or nearly so in the South; if the Winesap, a leading variety in middle latitudes, is entirely impossible as a useful sort in the North, is it not likely that important differences exist in the behavior of varieties even within the limits of the territory in which they are of recognized value and importance? That this condition actually prevails and more commonly perhaps than we have noticed is not difficult of demonstration.

In an address before the Maryland Horticultural Society a year ago, Professor Waugh called attention to the fact that in the Berkshire Hills it is possible to draw a very well defined line above which the Baldwin cannot be grown successfully and below which it develops to a good degree of perfection. I have made a similar observation with regard to the Winesap, grown at different elevations in Virginia.

In some of the mountain orchards in that state (Virginia), the Winesap behaves just about as I have seen it do in Maine, so far as the degree of perfection which it develops is concerned. The Grimes Golden apple grown at a certain elevation in North Carolina will keep a month or more longer than it will when grown at an elevation perhaps 500 or 600 feet lower than the first site. In the case referred to, the two orchards in question are owned by the same party and they are separated only by a comparatively short distance.

In a West Virginia peach orchard, where there is some 300 feet difference between the elevation of the lower and upper



sides, the same variety usually blossoms two or three days earlier on the lower side than it does on the upper side. There is also a corresponding difference in the ripening of the fruit in some seasons.

If you will note the fact, the differences in the behavior of the varieties just named are very definitely associated with the differences in the elevations at which they are grown. This incidentally emphasizes the importance or at least the influence of elevation in the behavior of varieties. But it should be noted that differences in elevation are primarily differences in climate, especially differences in temperature, so far as they affect fruit growing.

However, not all local differences in the behavior of a variety are directly traceable to marked differences in elevation. The Yellow Newtown apple, or the Albemarle Pippin as it is called in some regions, appears to be unusually susceptible to soil conditions, or what for lack of more definite information is attributed to soil conditions, very marked variations being readily apparent when it is grown on certain soil types; but the relative locations of these soil types with reference to atmospheric drainage, etc., may possibly have as much influence on this variety as have the differences in the types themselves.

You would, perhaps, like to have illustrations which are nearer home. I have no doubt that there is an abundance of them, but I do not happen to know about them. The ones I have mentioned are used merely as types to call attention to the fact that there may be marked local variations within the variety. If there are any principles involved in these variations, as there surely must be, they are operative everywhere and the evidence of their application is only a matter of observation. In Maine, there are plenty of differences based on relative elevation, soil types, latitude, etc., and if these factors are of importance in any region in accordance with fixed laws, they are likewise of importance here. And I venture the suggestion that, with your attention called to the matter, many of you can bring to mind particular orchards, or sections in particular orchards, in which some variety habitually does remarkably well, or it may be it is noticeably poor. No generalization can be made on such a speculative basis as this, yet where there are



such noticeable differences in the varieties as have been referred to, the chances are even, at least, that they are due directly to the conditions or to differences in the conditions under which they are grown.

The experience of apple growers in some of the well known apple districts in taking advantage of the special manifestations of varietal adaptability should be suggestive in this connection.

In the Grand Valley of Colorado, they planted pretty nearly everything in the earlier days in the way of apple varieties, as has been the case in many fruit regions during the pioneering period. But, as time has gone on, and the growers in the Grand Valley have become wise, they have gradually eliminated the undesirable sorts until now the orchards consist largely of four varieties which have proved to be of special value under the conditions in that valley. While many trees comprising numerous different sorts still exist, they are gradually being top-worked to one or another of the four leading varieties. In fact, I have never been in a district where so many trees, relatively speaking, have been top-worked as is the case in the Grand Valley.

Another example is the Hood River Valley in Oregon, where two varieties, the Yellow Newtown and the Esopus comprise a very large proportion of all the apple trees in the entire district. This is due to no other reason than the high degree of perfection to which these varieties develop and their satisfactory bearing proclivities under the Hood River Valley conditions. It is worth while to note the fact that both of these varieties are very restricted in their distribution and are not to be recommended for planting generally because of the idiosyncrasies with regard to their adaptation to conditions. But these two sorts have made Hood River famous. In fact if it were not for the Esopus and the Yellow Newtown apples, I doubt if anybody in this audience would know there is such a town on the map as Hood River, and I venture to submit that all this was because somebody in an earlier day was keen enough and observing enough, and far-sighted enough to appreciate the value of these varieties in the apple industry of that region and to lead the way in the planting of them.

Again, they claim in the Bitter Root Valley of Montana, that they can "beat the world" in growing the McIntosh. As a result of its merits under the conditions in this valley, the McIntosh is more largely planted in some portions of the valley, than any other sort. Another case of merely finding out a variety that was particularly well adapted to the condition and then being business-like enough to plant it as a leading sort.

Now, as I think of it, what important and widely known variety is distinctively a Maine apple? What variety, when mentioned by name, instantly calls forth the remark, "Yes, that's the apple they grow up in Maine." Or what section in this State has been made famous as the Hood River Valley has been made famous by its specialty--the growing of a variety, or at most a few varieties of apples, because of their superior merit in that particular section? The fault may be mine, if I view these queries in a negative way. Yet I submit the question: Has the variety problem as the apple growers in this State have to face it, been studied very much from the standpoint of the exceptional adaptation of varieties to particular sections of the State?

Of course, it does not necessarily follow that such marked cases of special adaptation of particular varieties as occur in the Hood River Valley and the Bitter Root Valley would be paralleled in Maine. Yet high hills and valleys, upland meadows and river bottoms, seashore and lake influences, and soil types of wide diversity all occur and each with its own little domain of local climatic and other factors of influence; and as the northern part of the State is approached, low winter temperatures become still more a complicating factor. There is no lack in the diversity of conditions prevailing within the borders of the State and under which apples are grown. And it would be strange indeed if there are not well defined cases of varietal adaptability of great practical value within the reach of Maine apple growers.

It may take close observation and require some reshaping of our mode of thought to correctly interpret the things which have been before our eyes so frequently that their significance is unseen. But I'll venture to guess that there are many orchards belonging to you growers here in which the Baldwin,

for instance, habitually excels for its excellence; orchards of which it is said in the various communities in which they are located: "It produces the finest Tompkins King of any orchard in this whole region." Or, it may be that someone says of an orchard: "It grows good Kings, but I never saw a Yellow Bellflower come out of it that was fit to eat."

Needless to say, these are hypothetical illustrations used merely to represent types of cases which are not uncommon, but the meaning of which is not always rightly interpreted and the practical bearing of which is sometimes overlooked. The only object I have in presenting them here is by way of calling your attention to the fact that such cases of marked varietal adaptability are not uncommon and to suggest that where they become apparent they offer a clue which, other things being equal, ought to be followed to its logical conclusion. If the conditions in an orchard give markedly favorable results with a particular variety, and that variety is a good commercial sort then plant it and make a specialty of it; if some other variety established in the orchard seems less desirable when all its merits have been duly weighed, then top-work it to the better sort. Cut out the star boarder in the orchard as the dairyman cuts out that kind of boarder in his herd of cows. In other words, take advantage of the information that Nature thrusts upon you, and use it in a business-like fashion. Study the behavior of your varieties with a view to ascertaining what sorts are really best fitted for filling the place for which you are growing apples and which ones are not coming up to a desirable standard either in the excellence of their development or in the actual cash returns which they bring on the market.

This matter of considering carefully any special advantages which you may possess for particular varieties, perhaps finds its most important application in the further development of the orchard interest of your State. In many regions the fruit tree agent is a much more potent factor in determining what varieties are planted than is the grower himself. The grower is more apt to buy the varieties that the nursery agent suggests than he is to buy those which, from a critical study of his own conditions he is convinced are of the greatest usefulness to him. And if the same community is canvassed by agents of different nurseries that are located in widely separated sections of the

country in which a wide range of varieties are propagated, the multiplicity of sorts that find their way into the orchards of the community is sometimes remarkable. A fine opportunity is thus made for the study of varietal adaptability, but it results rather disastrously so far as commercial interests are concerned.

Now it may be that some one would like to know what sort of a "program of varieties" the speaker would suggest for Maine orchards. I have to admit that I do not know of anything new to suggest nor any variety not already known to you that can be named in this connection which gives promise of a great future under your conditions. Note that I say "any *new* variety." You have the Baldwin, the Rhode Island Greening, Tompkins King, Northern Spy, McIntosh, Hubbardston, Wagener, and various others which are well known standard sorts and which are known to be sufficiently well adapted to a large part of the State to make the planting of them entirely safe as a rule. With these varieties you already have the making of a *great* future. For the northern parts of the State where hardiness of tree is of special importance, there is the Wealthy, the Northwestern, Patten Greening, Eastman, Malinda, Bethel and other hardy sorts from which to select.

Other varieties that are worth consideration for many sections but which are not much grown in this State, so far as I am aware, are Plumb Cider, Milding, Windsor, Mother, Arctic, Akin, and doubtless many others equally worthy of trial.

There are some varieties which, I understand, have been planted here quite extensively that in my judgment are of exceedingly doubtful value. If you want to know it, I suppose I have the Ben Davis especially in mind in making this remark. It is true that the Ben Davis has been the subject of many bitter attacks in recent years. It is a much maligned variety to be sure. But I know it has some staunch friends, even here in Maine—friends who insist that it is an apple of quality; that it is the most profitable variety they grow, etc. Even at the risk of calling down upon my head a "shower of protest;" at the risk of being told that I don't know what I'm talking about, I am going to advise against the planting of the Ben Davis here in Maine and for the reason that I believe you can do better. If the Ben Davis is your most profitable vari-



ety, then in my judgment there is something wrong somewhere in what you are getting out of your varieties which possess greater intrinsic merit. The Ben Davis has not sufficient merit to warrant such results. Many apple buyers are now refusing to take this variety or if they take it, it is under protest and only for the sake of getting others in the orchard where it is grown that are desirable.

If this variety could be marketed as a cooking apple and used only for that purpose, it would probably have a better standing. But justly or unjustly, an apple has to "pass muster" largely on the basis of its dessert quality.

I said a moment ago that I believed you could do better than to plant the Ben Davis. If you carefully study the list of possible sorts for planting, I am confident that you can find plenty of varieties which can be produced in Maine in such perfection that they can successfully compete with the best of fruit grown anywhere. The way of your greatest success lies in planting those varieties which are preeminently well adapted to your conditions, regardless of the fact that another variety may be the one which is of paramount importance in a region where conditions differing from your own obtain.

There is another phase of this Ben Davis matter that I want to mention. It is one which I believe is of a good deal of importance, though it has received but little attention. And in this connection I would use the Ben Davis as a type, rather than in its varietal significance, to represent all those varieties that are distinctly poor in dessert quality and which reach the market in considerable quantities. The most of you will admit, I think, that the Ben Davis is a very prominent member of such a group.

I do not know that it stands as a definitely enunciated economic principle, but I believe it is sound doctrine that when a commodity of poor quality repeatedly goes on the market in such large quantities that its presence is constantly conspicuous it is bound to injure the industry of which that commodity is a part. It must be admitted that a very considerable portion of the apples that enter into commerce are relatively poor in dessert quality. If my logic is sound, then the portion of the apple crop that enters the trade which is of poor quality must have



an undesirable effect on the apple market. If this is really so, it is important, and we ought to realize it. Let us see.

That man who makes two blades of grass grow where only one grew before is said to be a benefactor of the race. Granting this, then the man who makes two apples grow where only one grew before or perhaps even a good apple where formerly a faulty one was produced, ought likewise to be considered a benefactor. Now I submit, from the standpoint of the apple grower who has apples to sell, that he who eats *two* apples where he only ate *one* before must also be something of a benefactor. This matter of dessert quality goes a long way in determining how many consumers eat two apples instead of one. If you will only think of it, you know this is true in your own individual cases as apple growers. It is doubly true in the case of the man who has to part with his hard-earned dollar in order to eat apples at all. If you don't like Ben Davis, and its kind, to eat yourself, why are you so unreasonable as to expect the man in the city—the consumer—to like it any better than you do? That ultimate consumer is an important factor in your success as an apple grower. It's your job to make him eat as many apples as you can. The better he likes your apples the more of them he will eat. But he doesn't know varieties; he may know the name Ben Davis—it is doubtless the most widely known apple variety name in the world—but to the average consumer, it signifies only a red apple. He buys it. He eats it; and forthwith he says: "I am not very fond of apples anyway." It's a long time before he buys any more. But if he happens by chance to get a variety that really tickles his palate and makes his mouth water, he is going back in a hurry for more if he has a dollar in his pocket, or if his credit is good, lest the supply is exhausted before he can get to its source.

I believe, gentlemen, that my logic is sound, and that what I am trying to tell you about this quality matter is the plain, common, horse sense of the situation.

If what I have been saying is true, then the general effect of much of the fruit that goes into the apple market must be to restrict rather than to increase the demand for apples. I do not know that there is any actual proof of this proposition, but I know, and so do you, that if we care but little for a com-

modity, we get but little of it; the better we like it, the more of it we buy, as a general proposition. We care but little for apples of poor dessert quality; fruit of high quality appeals strongly to everyone. From the argumentative standpoint, at least, the conclusion is inevitable. I preach the growing of high quality varieties.

There is yet another phase of the variety problem that I wish to touch upon very briefly. Reference is made to the matter of breeding, or if you please to the *making* of varieties for particular purposes and for growing in definite regions. Comparatively little has yet been done in the breeding of our tree fruits. Almost every other field of crop production has been benefited materially by the result of breeding new varieties or new strains with definite ends in view. A very little has been accomplished in the breeding of fruits; but relatively speaking, the results thus far accomplished are so small as to be almost negligible, yet enough to give some indication of what the potential possibilities are. There are perhaps a half-dozen varieties of apples grown in this State at present which include the bulk of the fruit that is produced here. A large proportion of this bulk is doubtless made up of the Baldwin. We may assume that, so far as experience goes, these varieties are the best there are in existence for general commercial purposes here in Maine. It does not follow by any means that these leading varieties represent the limit of perfection attainable. On the other hand it is entirely possible, even probable, that varieties could be developed which on every count would excel those now in existence. It would require a long time to develop a new set of varieties but the field is a most promising, and to me, a most alluring one.

With such improved varieties an accomplished fact, they would of course take the place of old established varieties only very gradually, but the change would surely come, once the value of new sorts was recognized. An illustration of this fact is now in progress. During the past ten or twelve years, the Stayman Winesap apple has come into much prominence. It is a variety of great value and it is gradually superceding the Ben Davis in real Ben Davis districts. Stayman Winesap would not be likely to be of any value in Maine. This variety is, I think, doing more to check the planting of Ben Davis in many

regions than any other one thing. The Stayman Winesap apple is of double interest in this connection because it is the result of a definite, systematic effort to produce improved varieties. Its origination was not a chance accident.

That the improving of varieties specially adapted to particular regions is a practical conception and not merely a theoretical possibility is being emphatically demonstrated at the present time in the upper Mississippi Valley. In the early days, some of the people who did pioneer work in fruit growing in northern Iowa, proved to their own satisfaction that the varieties with which they were familiar in the East could not withstand the climatic conditions in their new home. The demonstration of this fact cost them dearly. One or two of these early settlers who had a clearer vision of the future than the others became convinced that apple growing could be made a successful line of industry if varieties could be obtained that would withstand climatic conditions. In northern Iowa, southern Minnesota and other territory in the upper Mississippi Valley, where the climatic conditions are similar the difficulty is not so much a matter of low winter temperatures as it is one of a very dry atmosphere, which together with low temperatures, makes conditions which call for a tree of remarkable hardiness.

For more than 40 years Mr. Charles G. Patten, of Charles City, Iowa, in a most altruistic spirit, has been devoting a great amount of time and energy to breeding fruit varieties which would be especially adapted to the upper Mississippi Valley. Naturally his earlier efforts were not as well directed and his conceptions of what was needed were not as definitely formulated as has been the case in later years, but the results of his labors have already given several varieties of apples to that section of the country which are of great value. The Patten Greening, the Brilliant and the Eastman are examples; and these resulted from his early efforts. Though now nearly 80 years of age, Mr. Patten is still continuing this work with enthusiasm unabated and with his confidence in the possibilities of effort directed along these lines constantly increasing.

A recent visit to his experimental grounds which include about 20 acres, in which there are under test probably 15,000 to 20,000 seedlings which represent the best selections of the past 10 or 15 years' work, fully convinced me that it was only

a question of continued effort when his vision of earlier years will become a great reality. He already has a dozen or fifteen varieties of native plums that have been developed by plant breeding methods which are probably better for his region than most other varieties now elsewhere obtainable. Among his seedlings there are a great number of very promising apples which, in hardness of tree, mark very distinct advances. In the very nature of the case, much of his apple work is still in a transition period and much still remains to be done. But there is every reason to believe that the ultimate end of this work will give to the upper Mississippi Valley a collection of apple varieties which will be fully adapted to the peculiar conditions of that region. They may be expected also to be of value in other regions where hardness of tree is a factor.

If Mr. Patten can develop varieties of apples and plums which make fruit growing successful in a region of the country where severe climatic conditions have largely restricted it, it does not require any stretch of the imagination to conclude that great improvement is within the range of possibilities in any region, but it will, of course, require the same sort of devotion to an ideal to develop such varieties as Mr. Patten has displayed in his work in Iowa. One of the greatest difficulties in the way of improving varieties generally is the tendency to let well enough alone, together with the fact that the stress of circumstances is not sufficiently severe to compel action, as was the case in Mr. Patten's region. Moreover, the improving of fruit varieties by breeding is a very long-term proposition. Perhaps this has been the most important reason of all why more attention has not been given to work of this kind. But one of the roads to a higher type of success in fruit growing leads in the direction of breeding varieties which are really fitted to particular conditions and for definite uses—not being satisfied merely with varieties that after a fashion can be made to do.

Now, in order to bring together in succinct form the points which I have tried to lay before you, I present in conclusion the following summary:

1. The fact of wide variability within the variety due to the influence of environment is fully established.
2. Because of the influence of conditions upon the behavior



of varieties, the matter of varietal adaptation becomes one of fundamental importance in commercial fruit culture.

3. The influence of even local conditions is sometimes very marked. Because of this, the most critical discrimination in selecting varieties for planting is often necessary or at least contributes largely to success.

4. Every fruit grower who is a real student of his business will take advantage of any local adaptations which he can find and on the basis of them he will specialize with the variety or varieties that he finds are best suited to his conditions.

5. The growing of varieties that are not fully adapted to the conditions under which they are produced results in the grower being less able to successfully meet competition than is the case if he is growing varieties of potential value that reach the highest possible degree of perfection under his conditions.

6. The planting of varieties of poor dessert quality is to be discouraged by every legitimate means because of the depressing influence of such varieties with reference to the consumption of fruit.

7. As a rule, it is better to plant for commercial purposes a few thoroughly tried and tested sorts known to be adapted to the conditions under which they are to be grown, rather than to take chances with doubtful varieties even though such varieties may be known to be of recognized value under some other conditions.

8. The planting of new and untried varieties for the purpose of determining their value under our own conditions is to be highly recommended if one is situated so that he can devote the necessary attention to such work, but it should be carried on apart from a commercial orchard. That is to say, a variety orchard cannot in the nature of things, be satisfactory as a commercial enterprise.

9. It does not follow that the varieties now shown by experience to be the best obtainable for any particular region necessarily measure the limit of perfection in varieties for the region.

10. The possibility of developing varieties that will be material improvements over present sorts is probably very great. Such development is possible by the application of well known plant breeding methods.



Proper attention to the propagation of present varieties is also doubtless a most efficient means of great improvement, but in due time there will be more definite evidence on this important matter.

With further reference to developing new varieties with a view to securing more valuable types, I want to urge upon this society the importance of this matter. Apparently the Baldwin, your most important commercial variety, is only barely hardy enough to withstand the climatic conditions which are likely to occur almost any winter. In fact, reports appear to indicate that the Baldwin tree has suffered serious injury in some parts of Maine several times during the past 10 years. The developing of a variety or varieties that shall possess all of the good points of the Baldwin and at the same time be better in dessert quality and hardier in tree would doubtless add untold value to the apple interests of Maine. That such an aim is possible of attainment there is no reason to doubt. The road to this end might be a long one. Then all the more reason for haste in beginning the work. The possibilities and the end in view are such as to emphatically justify the giving of early attention to it and when this society supports such a movement with its influence and its demands, it will in my judgment, be taking a most important step forward in the future welfare of apple growing in Maine.



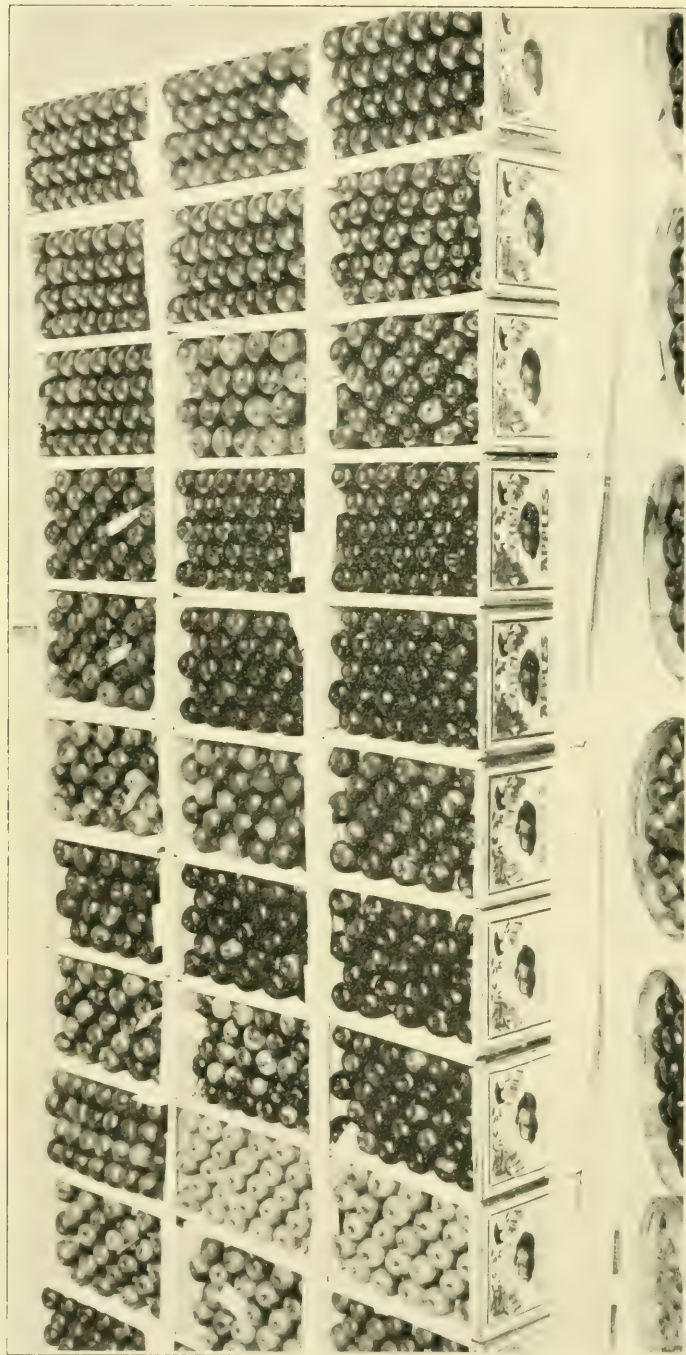


Exhibit of Orford Bears Fruit Growers' Association at Annual Meeting State Pomological Society, Portland, November 12-14, 1912.

WEDNESDAY EVENING.

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THE APPLE INDUSTRY,—PAST, PRESENT AND  
FUTURE.

By MR. J. H. HALE, Glastonbury, Conn.

(Stenographic copy.)

From the earliest settlement of our country apples have been grown. Our first settlers brought seeds with them from the old country, and later scions, and in the march of progress across our great country the apple-pie and cider-mill have kept pace with the church and school-house even to the Pacific coast. Our early settlers planted apples simply for the home supply of food and drink, more largely drink, and it was well into the last century before commercial orcharding became of any considerable importance anywhere, and then only in the few older sections of our country. The few apple trees that were planted under the early conditions were about the home and home grounds, or along the fences of some of the cultivated fields or mowing fields or pastures, and received practically no attention except what occasionally came from cultivating the fields adjoining them. The question of care as we know it today was never thought of. There was an occasional butchering in the way of a so-called trimming, simply to cut away lower branches that were in the way. That was the only style of trimming, and looking at trees between Boston and Portland this afternoon I saw any quantity of those old time butchered trees.

Our treatment of our trees was not bad method; there was simply no method at all in the old times. In the earlier days I suppose there was not the fungus and the insect troubles that we have today. But long before science came to our aid the fungus troubles of various kinds, and insect pests of every kind, were giving us a very inferior product. With the growth

of cities and towns there was a market for apples such as we had, and they were marketed in old baskets, in secondhand barrels, and very largely in bags or any way to get them there, regardless of results upon the fruit itself; and consequently we got very little reward for growing the apples and it was easy enough to say that apple-growing didn't pay. A little later came the city merchant, the commission merchant we have heard about, or the wholesale dealer, who found that he could get the apples in sufficient quantity on the market direct from the farms and went out into the country and bought and packed apples and taught us the trick of packing apples, of putting the best there were in single facing on the head of the barrel, and then a peck or half a bushel of a little inferior ones, but the best there were out of the piles on the ground, and filling up the barrel with anything. And these went upon the market and apples were sold and handled in that way. Just the way to destroy a market. Your worthy president of the Pomological Society, and toastmaster, said something about the inferior packing of apples in Rhode Island, Connecticut and Massachusetts. We have a grange down in Connecticut—which I hope you have up her in Maine—and it was my good fortune, and bad fortune for the Pomona Grange of New London County, to go down to one of their meetings a year or so ago. It was a fruit meeting and they wanted me to talk. I never want to talk, but they wanted me to talk on the fruit subject and it occurred to me that we had better have a text. And to have a text for this meeting I sent down to the wholesale fruit store and bought a barrel of apples. It was marked XXX No. 1 Maine Baldwins. We opened it up there before these Grangers of Connecticut and we found nine fairly good No. 1 apples on the head—it was faced up to look pretty well. The balance of the headings were 2's and 3's. Down the next layer we had a moderate number of 3's and the balance was low grade cider apples both in size and appearance—XXX No. 1 Maine Baldwins. You are just waking up. Within the last twenty-five or thirty years, or the last quarter of the last century, with the establishment of the agricultural college and the experiment station, the spread of the horticultural and pomological societies, the work of the institutes in the various states, the grange and the farmers' club and all these organizations working together, there has



come to the aid of the apple tree, the apple grower and the apple consumer, science; the science of horticulture, the science of pomology, the handling of the trees and the plants, and the diseases, insects and fungus troubles, and all have brought about an entire change in the handling of the apple trees and their production. The trouble is, many have heard the story over and over again. We heard the first call of science to the aid of the apple tree, we received those instructions, but paid little or no attention. And so we got left in the great race, the great apple race that is going on today, and our brothers across the Pacific coast went and did what we had been told to do, in the same manner that they were told by some experimenters, by some scientists, by some few successful orchardists who grasped the idea. They have made a success of it; and what has been the result. During the last six, eight or ten years, there has been a wondrous change in the markets of the world,—the fruit stands, the grocery stores, and the tables everywhere, in the show of beautiful apples. Just take the fruit stands and the groceries anywhere as you remember them ten years ago, and then go today and see the bright life that has come into them, say ten months in the year, almost the whole year round, by the glorious beautiful apples that were grown first in the Pacific Northwest, and as shown down here in the hall might just as well have been grown here from the start, but we didn't get the idea soon enough. They have been our teachers. They have been the practical people who have shown us that beauty of appearance, honesty of pack and uniformity of the package were requisite. To be sure, back of all their show of fruit has been the great railroads. The great railroads have financed them by the hundreds of thousands of dollars in their fruit show, in their exhibits all over this country. It has been a land boom in the West. The object has been really to sell land and not apples. It has been a general scheme to get eastern money to go there, and hundreds of thousands of dollars have gone out of Portland, and out of other towns in Maine, have gone out of Boston and all over New England, to help develop these apple orchards in the Northwest, and to buy the lands and to buy interests in the community orchards where by an investment of five times what the land was worth in New England as a first payment and then constantly paying for a

number of years, by and by you become the sole owner of a five acre tract or ten acre tract that would support you to the end of your days if the apples were to sell at the prices at which they have sold in the past. But they will not. To any of you who have an interest in a western community orchard, who have paid two-thirds of your money, I say, in Heaven's name quit, and save the few dollars still due on it, because the time has come when those things will not work out to our great satisfaction. And yet while we may criticise the West in a way, it has been a teacher and a great teacher. Following the boom in the West, Virginia and Maryland and West Virginia have gone to planting apples. In Virginia and Maryland there have been large plantings of three thousand, five thousand, ten thousand and twenty thousand trees, and the Governor of Maryland told me last December that there was one set of men in the western part of Maryland planting eight thousand apple trees on one tract, to be sold out to outsiders if possible and if not to be carried on to development. The worst of all of the apple orcharding of the past ten years has been the great number of inexperienced people who have gone into the business. They have been made to believe it was a great opportunity, with a slight investment of capital, with little or no hard work or care, to plant an apple orchard, and in a few years it would come into bearing; and look at the markets—apples selling at ten cents apiece, or \$2.50 to \$3.50 a bushel box.

There is a craze in New England at the present time on this apple industry. Now I am not afraid of the countryman who stays on the land because he loves the land and loves the trees, who believes in the things that Good Mother Nature gives us, and is going into the apple business. I believe he will succeed. But there are hundreds and thousands of men, now in the cities and in the factory villages, and all over this country, that are being tempted by the beautiful fruit they see on the market and the high prices of the beautiful fruit, by the wonderful shows like this one in the hall and the big shows in Boston and elsewhere—to run into this business believing that it means success every time. They are willing to take land that they can get anywhere. They think if they buy a little land and can buy some apple trees, and can put the two together, that they will have an apple orchard and success. And they need to stop and think a little.

If the man is all right, if he loves trees, loves the care and culture of them, doesn't mind spraying, doesn't mind all the dirty work on the farm, can get the capital necessary to buy suitable land, suitable trees, and all the necessary spraying machinery and fertilizers and labor, and is willing to watch and wait, and wait and watch, and wait some longer, and put in some more capital, then there is an opportunity. But it takes a long, long time. And it takes a great deal more money and a great deal more energy than it ever did before.

Within a week I was called to visit an orchard property where one successful business man of the city had agreed to pay the capital and a youngish fellow was to furnish the brains, and they planned at the start that for ten years it would take a certain amount of capital. They have reached the fall of the third year and that capital is all gone and they want to know what they are going to do for the other seven years. They can get the money but is it wise to get it? If they figured as best they could and the money for ten years had been absorbed in three years in the care of the orchard, it was a question with the capitalist whether it was advisable for him to put in more money and go to the end of the game or give the orchard to the young man and let him take it and do the best he could. As a business proposition, was it safe or wise to go on investing that amount of money?

I speak of these cases simply to hang out a sign of caution that we are going pretty fast. Some one has said "Why, we can always sell good apples." To be sure we can. But you cannot always sell the kind of apples that you have sold in the past, the low grade apples. Some one says "The poor man wants them." No, the poor man will see these beautiful apples and he will demand as good looking apples for himself as anybody else has. But he must have them at a low price, and the apples of the future have got to be grown, or delivered, at a moderate price. But it is going to cost something to grow them. Prices are low this year. Our friends on the Pacific Northwest, two or three years ago were telling us we should not have to sell an apple below \$1.50 a box f. o. b. They were then getting \$2.25 to \$2.50. This year they can't sell them at all out there. Very few apples are selling on the Pacific coast at any price. Buyers who went there in former years to make money

are afraid, and so the western man today are putting their apples in storage or selling them on the market for what they can get. You can go to New York and buy Hood River apples that are not bringing the growers there thirty cents a box. I have seen them within a week, Spitzenburgs, that would not net the growers back in Oregon thirty cents a box in the orchard. The problem that is before us, is to produce the beautiful apples that we are beginning to show now and sell them at a price so that the common people can consume them in the quantities that we are producing them. In the Pacific Northwest only one tree in five is in bearing, and yet they do not know what to do with their product. Multiply it by five and what are they going to do? Why, they say, when the Panama Canal is done we are going to load them on ships and send them to Europe. Europe will soon get filled. It will not give a market at any such high prices as in the past.

At present you have to pay pretty fair wages, you have to spray where you never had to spray before, and you have to cultivate, and then you must have newer and cleaner and better packages costing more money every year; and yet you have got to dispose of the apples that you have already planted trees for, or are planning to plant for, you have got to sell them at the same old price. Can you do it? Are we willing to do all the things that are necessary and then take the moderate reward?

This apple growing proposition is no easy get-rich-quick scheme by any means. We began to think it was. We have seen the fancy prices of apples on the fruit stands and we have got the high price craze. But we are at the top of it. The five and ten cent apiece apples and the \$3 a box and the \$5 and \$8 and \$10 a barrel apples have had their day. We have learned to grow good apples. Science has taught us and the West has taught us how. We have learned to pack good apples. We have got more common honesty in the apple barrel than was ever there before. There is a place for some more in the middle of the barrel yet, but we have made a great forward step. The passage of a United States law regulating the packing and grading of apples is a long step forward, and we are making strides along every line, but we must not think that we are going to get a very much greater reward for our labor on the apple than we are any other line of agriculture or horticult-



ture that we may follow with equal energy, equal skill, equal brains and equal capital. That is the sign of caution that I would like to give you here tonight. With the right sort of soil, elevation and location, the man who loves his business, the man who enjoys caring for the tree for the tree's sake whether it gives dollars or not, the man who wants to grow beautiful apples because they are one of the most beautiful of God's gifts to man, and grows them for their sake alone and for the sake of the production of something better for his fellow men than any one else can produce, who puts love and care and thought into it all the way,—will always get a reward, perhaps not as great as we have anticipated in the past, but there is a great opportunity for him. But there are too many going into it who have not that love of the business, who have not faith in the business, but have simply been led to believe that it is a gold mine. They had better go reasonably slow.

If you are going into it, you must locate your orchard, your commercial orchard, reasonably near to proper lines of transportation. I don't think that the commercial orchard of the future can get much more than two and a half or three miles away from a railroad station with safety. It is a heavy product and has got to be handled at a low price. If you are doing your business upon a large scale, you can go it alone perhaps in the way of packages, in the way of cold storage, in the way of sorting, marketing, grading, and the handling altogether, but in the more modest way that we do things in New England, mostly with small capital and small means, there must be a coöperation, there must be a working together, a general supervision over all the orchards managed in one particular way in such a community, a supervision over the spraying, over the thinning of the fruit, over the harvesting and the grading, a coöperative cold storage house, coöperative marketing, a general working together to cut corners and save expenses. It is the little one cent on a barrel here and the half cent there and the two cents somewhere else that you may save that is going to be a profit that will pay dividends. The dividends come out of the last few cents on top of a barrel of apples or the last few cents saved in the expenses, and that is what we must live up to. We must pull close together. If we don't we are going to get fail-

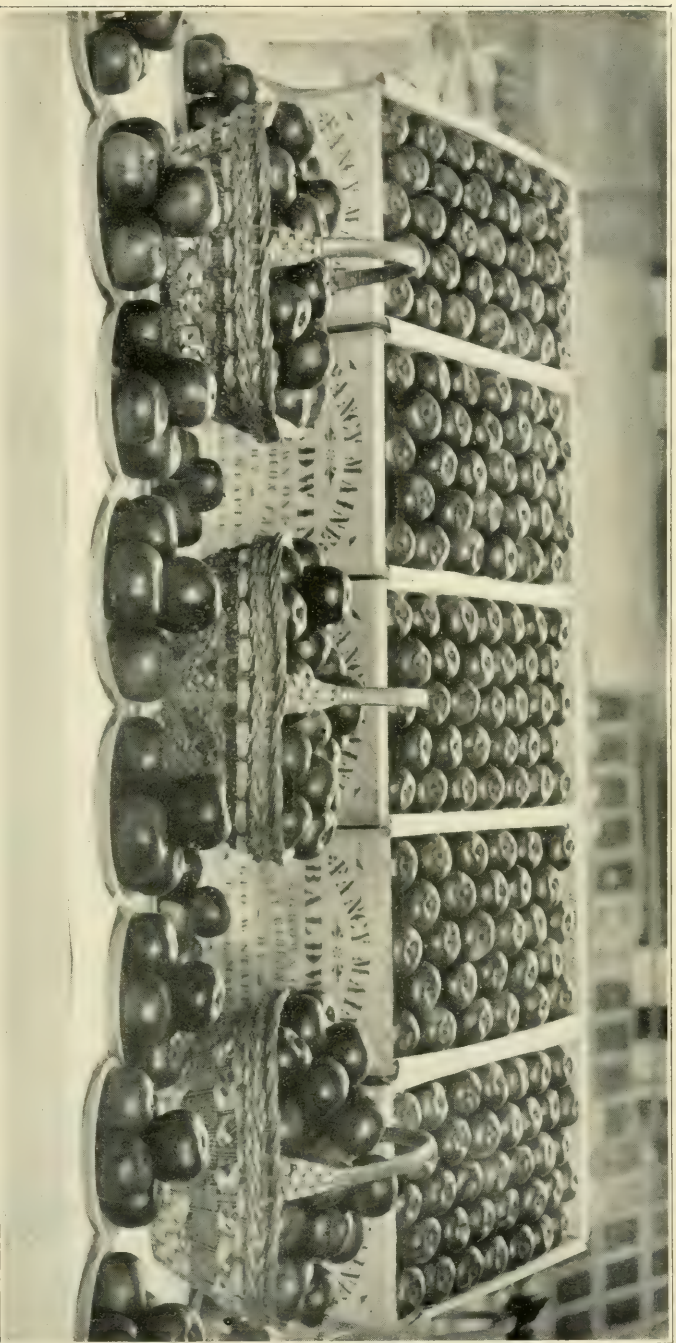


ure. It does not matter how much of an acreage we have or how many trees we have or how much fruit we have in a reasonably small way, we can add to the profits or reduce the expenses of that operation by the most earnest coöperation. The only possible success that our friends in the Pacific Northwest have made, and in the Rocky Mountain coast, is largely the profit in the coöperative handling, in their working together. We of New England have been a little too independent.

The question of packages for the present and future is a very serious one. The old, high barrel has been a very easy package for us to use, and where the groceries break them up in quarts and pecks and half pecks and half bushels, they have a reasonably wide distribution. But we must get a wider distribution. We must get the orchard package directly into the home, into every home in the land where apples are consumed. You can sell a family a half bushel, or a peck, or a bushel, and once get them into the family and the children will do the rest to some extent.

I don't believe in getting around the middleman,—the wholesaler and the grocer are just as necessary as the horse and mule or old ox on our farm, they are part of the machinery of production and marketing, but at the same time they, as our agents, want so far as possible to be able to pass the package along from the grower to the consumer unbroken so as to increase consumption. And whether the box of the Northwest which holds a bushel is the right size package or not, I am not sure. I am trying myself in an advertising scheme to reach the consumers direct with that package and we find that it is reasonably satisfactory. I think it will be better for us to find the largest possible package we can get into a home and then fill that package full of glorious good apples, top, bottom, middle and all over—give them more than they expect every time. I believe that will help us. But we have got to sell at a moderate price, and that is the thing for us to work out.

I seriously believe, under present conditions of labor, the necessity for spraying three or four times, the pruning, the feeding, the culture and the new high class package, that you can't put up a barrel of apples as good as is demanded today for one cent less than \$2. You must reckon two dollars as the cost of production of a barrel of good apples one year with



Portion of Exhibit of Geo. W. Staples' Temple, at Annual Meeting State Pomological Society, Portland, November 12-14, 1912.



another. The West has taught the people to want beautiful apples and we have the quality to give them—and we can't go backward, we have got to produce these beautiful apples.

How can we reduce that cost of \$2.00? How can we get a price above \$2.50? These are the problems that need to be solved and need to be solved very seriously. And you gentlemen who have only small sums of money saved up, a few hundred or a few thousand dollars, figure out how far that will go in establishing,—not establishing an orchard, but maintaining and caring for an orchard for ten years till it begins to give you some returns. Consider the five-year old Baldwin this year with a bushel of apples on it, but don't expect an orchard to do that. You have got to figure to live for ten years and take expensive care of the trees. It is a business proposition. If the moneyed men here in Portland or in Maine are going to invest money in this enterprise, remember it is a long interest wait. A return will come sometime if the right men are hold of the game as it will with any other solid investment, but don't think it is coming in a pile and going to bring enormous dividends. It will not do it.

Another thing—this is what I am going to say about the future. If there is any one here in this hall who hasn't got an apple orchard and wants one, hold up your hand. Two of you,—only two in this whole company! Have all the rest of you got them? Well, I want to say to you here tonight, those of you who have not orchards and want them, sit down and keep hold of your money and wait five years and you can go out and buy the other fellow's orchard for a quarter what it would cost you to develop it. Yes, I believe that, though it may be heresy, it may be talk that ought not to be given at a Pomological Society meeting. I have been an optimist all my life. I have been a farmer and horticulturist all my life and I have been an optimist from the very start. I believe in looking after the good things in horticulture, and I have faith in the New England people as I have in the people of no other part of America. We are at the head here in quality. We are equal in beauty. We have as strong and as fine soil as anywhere on earth for the production of apples. We have everything here. Within twenty-four hours ride of your Maine farms are thirty million people with more money than any other like number

on the face of the globe, and they desire beautiful fruit, they want the best and are better able to pay for it than anywhere else. And if anybody on earth or in America can make money in the production of apples, we can here in New England. It is a great opportunity. But, nevertheless, I have hung out the sign of caution, and I hope it will do some of you some good.



ANNUAL BUSINESS MEETING THURSDAY,  
NOVEMBER 14, 9 A. M.

Called to order by the President, H. L. Keyser.

The following Committee on Resolutions was appointed by the President: D. H. Knowlton, Farmington, Dr. G. M. Twitchell, Auburn, Charles S. Pope, Manchester.

An invitation from the Bangor Chamber of Commerce, for the Pomological Society to hold their Annual Meeting in 1913 in the city of Bangor, was read.

Voted, to refer the invitation to the executive committee.

The Secretary made his report as follows:—

REPORT OF SECRETARY.

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*Mr. President, Ladies and Gentlemen:—*

A meeting of the Executive Committee was called by the President for January 5, 1912, but owing to a severe snow-storm a quorum was not present.

A meeting of the committee was held at the Augusta House, Augusta, on May 3.

It was voted to hold the annual meeting in Portland and the President was instructed to make the arrangements for the meeting.

It was also voted to invite the New England Fruit Show to meet with us.

The President was instructed to arrange the special premiums. Through his efforts and the hearty coöperation of the Portland Board of Trade, the Pomological Society has the best premium list ever offered for the fruit exhibitors of Maine.

The annual Field Meeting was held at Highmoor Farm, Monmouth, on August 2. A large number of fruit growers

from all parts of the State were present and one of the most profitable field meetings was enjoyed by all.

During the year the Society has lost by death one of our most respected and esteemed members, Ex-President Z. A. Gilbert of Greene. It would be very appropriate for those of us assembled here in the annual meeting of 1912 to remember that to him and his associates we owe a debt of gratitude and appreciation for their grand work as pioneers in this department of agriculture and for the safe and sure foundation they laid for a permanent organization solely devoted to the fruit interests of Maine. In all this they manifested great foresight and wisdom in recognizing the splendid advantages to fruit growers arising from the natural adaptability of the soil and climate of *the State of States*.

This present exhibition is a rare and fitting tribute to their much appreciated services.

During the year there has been more interest manifested by the fruit growers of the State to avail themselves of the advantages of membership in the Society.

We have at present 132 life members and 40 annual members being the largest number of annual members before our annual meeting. Let us use our best efforts to make it 250 life and 250 annual members before the close of this year, making a total of 500.

Our reports for 1911 have just been received and will soon be mailed.

In conclusion let me suggest that as we are about to enter upon a Legislative Session, the fruit growers should remember that no one else will look out for the fruit industry of the State but the growers themselves. Let us then be up and doing, continually.

Respectfully submitted,

E. L. WHITE.

Voted to accept the report.

The report of the treasurer was presented as follows, and approved.

### RECEIPTS.

Cash on hand from the year 1911 .....	\$132 21
Jan. 2, Received from the First National Bank, Farmington	16 00
interest on bonds .....	22 50
July 2,           from First National Bank, Farmington...	16 00
interest on bonds .....	22 50
Nov 19,           Augusta Trust Co., Winthrop.....	7 49
Dec. 13,           for space in hall.....	28 00
20,           part of state stipend.....	413 06
31,           life membership fee.....	90 00
Annual Membership fee .....	92 00
Feb. 26,           balance of state stipend for 1912.....	586 94
Portland Board of Trade .....	94 88
Total Receipts .....	<hr/> \$1,521 58

### EXPENDITURES.

Nov. 15, Paid E. F. Hitchings .....	\$41 00
E. E. Howard .....	1 00
Wallace S. Ladd .....	14 71
Augusta House .....	3 00
W. E. Leland .....	3 55
E. F. Hitchings .....	1 50
Me. Federation Agricultural Associations....	6 00
George W. Staples .....	35 00
W. F. Dunham .....	4 25
W. W. Brown .....	10 62
W. F. Dunham .....	3 50
Lewiston Journal Co.....	3 25
W. F. Dunham .....	4 75
Waterville Sentinel Co. ....	20 91
Me. State Bookbinding Co.....	5 45
Lewiston Journal Co. ....	10 00
Brunswick Pub. Co. ....	2 75
Frank A. Waugh.....	38 12
Shaylor Ingraving Co.....	15 00
W. E. Leland .....	6 10
E. L. Lincoln .....	2 35
E. L. Lincoln .....	6 50
Dec. 31,           E. L. Lincoln .....	25 00
E. L. Lincoln .....	5 00
Bertha Babb .....	2 00

H. H. Withwill .....	2 39
E. F. Hitchings .....	1 52
E. F. Hitchings .....	5 76
W. E. Leland .....	4 35
M. C. R. R. Co., freight.....	4 60
Wallace S. Ladd.....	1 32
H. P. Gould .....	36 00
Premiums .....	386 50
H. H. Whetzel .....	64 48
E. L. White .....	34 90
F. C. Sears .....	41 18
Wilfred Wheeler .....	35 49
Congress Sq. Hotel .....	170 11
James P. Porter .....	25 10
Transfer to permanent fund.....	90 00
E. L. White .....	150 00
Lewiston Journal Co.....	10 00
F. R. Conant Co. ....	2 25
Mrs. L. B. Raynes .....	64 77
P. E. Simmons .....	3 64
F. H. Morse .....	10 05
Wilfrid Wheeler .....	15 00
F. C. Sears .....	15 00
W. W. Brown .....	8 00
Maine State Bookbinding Co.....	15 35
E. L. White .....	8 06
H. L. Keyser .....	25 05
H. L. Keyser .....	6 00
Maine State Bookbinding Co.....	13 40
<hr/>	
	\$1,521 58

Permanent fund for the year 1912.....	\$1,980 00
Life fees for the year 1912 .....	90 00

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\$2,070 00

Permanent fund invested at follows:

4 shares stock, First Nat'l Bank, Farmington.....	\$400 00
2 bonds Stockton Springs Water Co., "First mortgage".....	970 00
Deposit in Savings Banks .....	700 00

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\$2,070 00

Respectfully submitted,

ELLIS L. LINCOLN,

*Treasurer.*

The President then appointed the following committee to receive, sort and count votes: Mr. A. K. Gardiner, Mr. Clement, and Mr. Littlefield.

The following officers were elected for the ensuing year: H. L. Keyser, Greene, President; W. H. Conant, Buckfield, First Vice President; A. K. Gardiner, Augusta, Second Vice President; E. L. White, Bowdoinham, Secretary; E. L. Lincoln, Wayne, Treasurer; Member of the Executive Committee to serve for three years, Prof. E. F. Hitchings, Orono.

Member of Experiment Station Council for one year, Mr. Robert H. Gardiner of Gardiner.

Voted to leave the election of the trustees in the hands of the Executive Committee.

The following were elected as representatives to the Federation of Agricultural Societies of Maine: H. L. Keyser, Greene; W. H. Conant, Buckfield; E. L. White, Bowdoinham.

Representative from Maine to the New England Fruit Show, Homer N. Chase, Auburn.

Voted, that in the possibility of any vacancy in any office, the Executive Committee be instructed to fill the same.

The committee appointed at the last annual meeting of the Pomological Society to take under consideration the matter of the State Fruit Farm, reported as follows:

We find that the law passed for the purchase of the farm also put the management of the farm into the hands of the director of the experiment station and the receipts and expenditures are kept by the treasurer of the University of Maine, which are open for inspection. Every item goes on, everything sold from the farm and everything that is paid for. We think that those figures would be useful if they were published. We understand an appropriation is to be asked for in the next legislature and when that matter is brought up any amendments to the original law will be in order.

Respectfully submitted,

JOHN W. TRUE,

*For the Committee.*



Voted to accept the report.

Dr. Twitchell reported for the Committee on Resolutions as follows:—

*Resolved*, That this State Pomological Society, recognizing the marked results obtained at our State Fruit Farm, and realizing the necessity for direct knowledge of the methods and cost of storage of fruit, would urge upon the legislature the importance of an appropriation for the erection of natural and artificial cold storage plants at Highmoor, said construction and future maintenance to be conducted in such manner as to furnish an object lesson in different methods, and a full knowledge of cost to the apple growers of the State. The increasing crop of fruit renders this step necessary, while the necessities of individual growers make imperative the solution of economic and permanent construction upon a basis within the reach of the small farmer.

The question of choice of system is one the State may well determine without further delay for the future good and profit of the growers, as well as the proper handling of the fruit at Highmoor.

*Resolved*, That the sincere thanks of this Society are due the City of Portland, the Board of Trade and business men, the press of the State, the railroads and all co-operating agents to the complete success of this great exhibition and the thirty-ninth annual session of this Society.

*Resolved*, That it is with just pride we view the marked improvements in uniform grade fruit exhibited here, and would recommend that hereafter, all boxes, barrels and plates of defective fruit be excluded from display at our annual exhibitions.

*Resolved*, That we affirm our belief in the importance of offering liberal prizes at future exhibitions for small packages, where fruit and package may compete together and the public be educated to the worth of this method of disposal of our fruit.

*Resolved*, That the time has come for a reclassification of our premium list, the dropping of varieties having no positive hold upon the market, and the centering of effort on the thorough testing of new varieties with special reference to adaptability to Maine conditions and to insuring a quality superior to the best standard winter apple of today.

*Resolved*, That we endorse the action of the Committee on Legislation to insure the growers all items of expense attending the growing and marketing of crops and products at our State Fruit Farm.

*Resolved*, That we urge upon the farmers of the State hearty co-operation in the extended demonstration work now being organized by the University of Maine.

*Resolved*, That as interested growers of fruit we would express our appreciation of the services of our State Horticulturist and his cordial spirit of co-operation with the society at all times and under all conditions.

*Resolved*, That we heartily endorse the recommendation of President Keyser, that an effort be made to increase the state appropriation for the further extension of the work of this Society, and to promote the growth and further development of our pomological and horticultural interests.

*Resolved*, That in the death of the Honorable Z. A. Gilbert, the Maine State Pomological Society has met with an irreparable loss. In view of this loss and his long and faithful service as president of this Society, we recommend that Dr. George M. Twitchell, a long time associate and intimate friend of Mr. Gilbert, be invited to prepare an appropriate memorial and sketch of his services to the Society for publication in the next annual report of the Society.

*Resolved*, That it has been a great pleasure to our Society to greet and welcome the representatives of the fruit and horticultural societies of other New England States. Their presence and assistance have contributed largely to the success of our meeting. May they be with us often in the future.

D. H. KNOWLTON,  
G. M. TWITCHELL,  
CHARLES S. POPE,

*Committee.*

Voted, to accept the report as a whole.

Prof. E. F. Hitchings presented the following:

Owing to the great and increasing volume of summer visitors; to the natural adaptability of our soil and climate to the growing of choice vegetables and flowers as well as fruit; and recognizing the fact that there is a great and growing demand for first class vegetables throughout our State; and realizing that horticulture is fast becoming an important industry; and believing that the three divisions of fruit, vegetables and flowers should be given due recognition:

Therefore, be it resolved that we request the next legislature of Maine to change the name "Maine State Pomological Society" to "Maine State Horticultural Society."

Voted to lay the matter on the table.

Prof. E. F. Hitchings also recommended that the date of the Annual Meeting be one week later in November.

This matter was referred to the next annual meeting.

Mr. Clement of Winthrop presented the following:

No state institution which receives state aid shall compete for prizes against individuals or associations.

Voted to adopt the same.

## CO-OPERATION IN THE CONTROL OF FRUIT DISEASES IN NEW YORK.

H. H. WHETZEL, Professor of Plant Pathology, Cornell University.

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### IMPORTANCE OF FRUIT DISEASES IN NEW YORK.

While the total value of the fruit crops in New York is surpassed by that of hay, grain, potatoes, etc., it is nevertheless a total of sufficiently large proportions to warrant extensive investigations of those diseases which tend annually to reduce it. New York is justly noted for the importance of her fruit industry and the intelligence and enthusiasm of her fruit growers. She has always led in educational efforts for the upbuilding of horticulture. A pioneer in the nursery business, she still remains the greatest producer of nursery stock in the United States. She supports today two of the largest fruit growers' associations of this country and her nurserymen stand high in the councils of the National Nurserymen's Association. In the production of small fruits she has few equals. She is par excellence, the deciduous fruit State of the union. True to their conservative natures her growers do not make the noise of their western competitors, but they have continued to furnish the great bulk of the staple fruits for eastern markets.

For many years the leader, both in extent and variety of her fruit industries, it is not surprising that the fruit plantings of New York should suffer from a greater variety of diseases than those of most other states, and while New York has led in the development and application of means for their control, the total annual losses to the fruit crops of the State are still enormous.

Wallace estimated the loss from apple diseases in the State of New York at about three and one-half million dollars. Our

recent work on the fire blight in nursery stock indicates that a large percentage of the apple, pear and quince trees are lost each year, while the injury from this disease in pear and apple orchards is often appalling in certain sections. On account of the difficulties of getting accurate records of losses in a sufficiently large number of cases, no satisfactory estimate of the total loss to the State from diseases affecting fruit can be made. This loss, however, is annually a heavy drain on the fruit industry of the State and represents one of the most serious leaks in the fruit business; serious because of its proportions and the difficulties of reducing it.

The control of the diseases of plants calls for the application of highly technical scientific principles and demands of the grower an exceptional degree of intelligence and interest. These problems demand in addition to intelligence and education on the part of the grower, the service of highly trained specialists in this field of science, namely plant pathologists or, as we call them, plant doctors. The growers of the State of New York have been especially fortunate in having at their service for the past fifteen years so noted a pathologist as my friend and colleague, Mr. C. F. Stewart of the State Experiment Station at Geneva. Mr. Stewart's studies and investigations have covered an exceptionally wide range of crop diseases but to none has he made greater contributions than to those of fruit. There is scarcely a disease of our fruits which he has not at some time studied and toward the control of which he or the men working under him have not contributed suggestions or experiments of marked value to our growers.

But the diseases of fruit are far too numerous and the problem to be solved too complicated to be met and solved by one or even several men, however well trained or experienced. There yet remains endless work to be done before this leak in the fruit business will be entirely stopped.

#### USUAL RELATION OF THE STATE TO THE GROWERS IN THE CONTROL OF CROP DISEASES.

When the speaker came to the work in the New York State College of Agriculture in 1906 he found in operation there the three usual provisions for the investigation and control of plant

diseases. One or more of these are to be found in operation in most states at present I believe. They are:

1. The maintenance by the State, through state appropriations at the college of agriculture and the experiment station, of an expert plant pathologist or botanist, together with one or two assistants in each case and the necessary equipment for laboratory work.

2. Provision, also by state funds, to the college of agriculture, for extension work among the farmers of the State. A very small part of this fund was in our case available for purposes of disseminating knowledge in regard to plant diseases and their control. This work was mainly in the nature of short talks or lectures here and there about the State. In addition to this some opportunity was afforded for similar extension work in the farmers' institutes on funds appropriated to the State Department of Agriculture.

3. Provision for the inspection of fruit trees, chiefly nursery stock, and the destruction of such as show serious infection by certain insects or fungi. This work in New York is also supported by state appropriations to the State Department of Agriculture.

Your attention is directed to the fact that these different means of attacking the problems of plant diseases and their control are supported solely on state or federal appropriations.

#### SOME OF THE PROBLEMS BEFORE US IN 1907 TO WHICH THE GROWERS WERE DEMANDING INSTANT ATTENTION.

1. The black rot of grapes. In 1906 an epidemic of black rot had resulted in an almost total loss of the crop in many sections of the grape regions. The industry was threatened and the discouraged growers cried loudly for help.

2. Apple Scab and Bordeaux Injury. Ever since bordeaux came into general use in the State for the control of apple scab more or less injury to foliage and fruit had been reported. So serious had the matter become that in 1907 Professor Hedrick, Horticulturist of the State Experiment Station, issued an extensive bulletin (No. 287) giving a summary of the known facts and the results of his observations on this problem. No satisfactory solution of the difficulty, however, was offered and by



1909 the growers were demanding some substitute for the bordeaux as the most satisfactory way out of the difficulty.

3. Serious epidemics of fire blight in several nursery sections of the State had broken out and the nurserymen desired to know what measures might be taken to reduce the losses. The spraying of nursery stock for the control of leaf blights, etc., which were often destructive, was rarely practiced though the need was evident in most nurseries.

4. The ravages of the fire blight, especially in the pear orchards along Lake Ontario were becoming increasingly alarming and threatened the destruction of the industry in certain sections, while its appearance in the twig blight form on apples in many localities was causing marked apprehension on the part of the apple growers.

5. The increasing interest in apple growing was directing attention to the neglected orchards of the State and information on the nature and control of the apple tree canker was constantly being called for.

The above were but a few of the fruit disease problems demanding our attention. The resources available for meeting the situation were pitifully inadequate. Each problem called for the undivided attention of one or more men for a period of from two to several years. With only one assistant and \$800 in 1907 with which to meet these demands and with a large number of students to be taught in addition, the prospect of getting results of any great or immediate value to the growers was most discouraging.

#### A NEW POINT OF VIEW.

For a year or two I lived, like my colleagues, in the hope that increasing appropriations by the state legislature would afford means for meeting the problems which in increasing numbers pressed for solution. Material increases in the annual budget for our work came but these were so inadequate for the work demanded of us that I soon began to realize that we could not hope to receive sufficient support from the State to meet the situation, certainly not within the period of our ambitious youth. What our growers needed and demanded of us was some immediate assistance in the solutions of their difficulties.

Finally in the winter of 1909 the demand for a substitute for bordeaux in the spraying of apples reached an acute stage. Aroused by the glowing reports of success with lime-sulphur in the Pacific coast apple regions and the appearance on the market of commercial concentrated lime-sulphur solutions for summer spraying for which unsubstantiated claims were made, our growers insisted on definite data as to the efficiency of this new fungicide under our eastern conditions. Loaded to our full capacity with problems already under way and with no prospect of adequate increases in our department budget to meet this new problem, I began to cast about for some means of meeting this legitimate demand of our growers.

In the midst of this dilemma there came to my hands in one of our scientific journals the description of a new type of coöperation which was being effectively worked between the department of chemistry of a western university and certain commercial concerns having problems of a chemical nature. So effective did this coöperation appear to be, not only in solving these problems, but also in training young investigators for further service along these lines, that I thought I saw here a solution of the difficulties in which we found ourselves relative to the problems in plant disease work.

After careful consideration of this scheme and full discussion of the problem with Director Bailey, we worked out a similar plan for coöperation with our constituency. The purpose of our first coöperation of this type was to get definite data on the question of the substitution of lime-sulphur for bordeaux in the spraying of apples. Care was taken in entering into the coöperation that no strings should be attached by which the commercial concern supplying the funds could make undue capital out of its relations with the University, and the contract received the full approval of the Director of the College and the Board of Trustees. The fundamental feature of this coöperation was the financial consideration, the Niagara Sprayer Company depositing with the Treasurer of the University the sum of \$1500 per year for two years to provide salary and traveling expenses for a young plant pathologist to undertake a careful investigation of the problem. His appointment and all expenditures of the money deposited were to be under the complete control of the Director of the College with provision

for cancelling the contract by the Director at his discretion. The College on its part agreed to provide the necessary laboratory equipment for the work and the necessary time of the head of the department of plant pathology to oversee and direct it. This coöperative arrangement was known as an Industrial Fellowship. The young investigator was to be at the same time a graduate student in Cornell University, receiving training for his advanced degree along the lines of plant pathology. It was further provided that this work should be conducted in a field laboratory in an orchard section in some part of the State during the growing season.

About the same time a similar arrangement was entered into with the Stuart Nursery Company of Newark, N. Y., for the investigation and control of the fire blight and other diseases in nursery stock. Since that time no less than twelve industrial fellowships have been established in the department of plant pathology in Cornell University, supporting the work of 20 men and representing a total of thirty-five thousand dollars including the sums being expended this year. In addition to this we have had during every growing season since 1908 coöperative arrangements with growers or commercial concerns for the season only (about three months) by which one of these young investigators is stationed in orchard, field or vineyard for the purpose of trying out his efficiency in meeting some special plant disease problem. This is usually understood to be preliminary to the establishment of a two year industrial fellowship and in most cases has so worked out. The young man has made good.

Last season we had in the field under this or similar arrangements no less than twenty-five men in seventeen field laboratories in different counties of the State.

This method of attacking the plant disease problems of the State was a radical departure for a state institution. It was the outcome of a pressing necessity and called for a new point of view in state college work. This point of view may be expressed in the following propositions:

1. It is the business of the State through its college of agriculture to provide the means in the form of a staff of experts and equipment by which the constituency of the college may be assisted in the solution of their problems.

2. The people on their part should provide means to meet the State (through the college) at least half way, in the solution of these problems.

3. Financial support by those most vitally interested in the solution of the problem is the surest means of enlisting their interest and in establishing practical methods for disease control.

4. With the financial support of those who have problems to be solved we are enabled to meet the demands of a much larger number of our constituency than under the old plan.

5. If it is worth nothing to the grower in dollars and cents of his own money to have these problems investigated, then it is not proper for the college to spend the State's money for that purpose. And if it is worth something to the grower in dollars and cents then he should be expected to put money into it.

6. During the growing season the field where the problem lies rather than the college is the important place for the prosecution of these investigations.

Many other sound reasons for such a coöperation will occur to you if you will give the matter some thought. The hearty support which our growers have given the scheme and the marked results we have obtained in a short time are ample justification of this new type of coöperation. I hasten to a consideration of some of the results which we have to offer.

#### RESULTS.

At the winter meeting of our State Fruit Growers' Association in 1909, at which there were at least 500 growers present, in presenting a summary of the then known data on lime-sulphur as a summer spray, I asked those who expected to use lime-sulphur the following season instead of bordeaux for summer spraying of their apples, to stand. Only one or two arose and that with some hesitation. During that season and the next our investigations on the use of lime-sulphur as a summer spray were carried out by Mr. Wallace on the Niagara Sprayer Company Fellowship. At the winter meeting in 1911, after two seasons' evidence on the use of lime-sulphur, I called on those who still proposed to use bordeaux to stand up. Of the one thousand odd growers present only two or three arose. Thus completely had the practice of our growers as regards



these two fungicides been changed and I believe I am just in attributing this in no small degree to the results we had shown at the summer meeting of the State Fruit Growers in our experimental plats at Sodus, N. Y. (1910). Over 1500 growers saw these results. With this evidence many of you are doubtless familiar from our publications on the subject. Lime-sulphur continues to be practically the only summer fungicide used by our growers for their apples. In fact bordeaux as a spray mixture for most fruit diseases has largely gone out of use.

In 1910 the apple scab appeared in epidemic form throughout the Genessee Valley just before the blossoms opened, with the result that the set of fruit was almost completely destroyed. The farmers of Genessee County, while not primarily apple growers, expect considerable returns from their small farm orchards. Aroused to interest in their orchards by the growing incomes of their apple growing neighbors to the north and filled with exceptional anticipation by the heavy blossom of 1910, they saw with chagrin the failure of their fruit to set and called upon the college for information and assistance to prevent a repetition of such a catastrophe in the future. At a meeting of Genessee farmers in the summer of 1910 we proposed the organization of a local fruit growers' association and the establishment by them of an industrial fellowship to provide for one or more field laboratories and the location of a young plant doctor or entomologist in each. Two organizations were effected, which were afterward merged into one, and three young men (two plant pathologists and one entomologist) were stationed in the county the next season to advise with the growers, direct their spraying operations and conduct experiments on the control of diseases and pests of their fruit.

So satisfactory was the arrangement that at the end of the first year the growers united in an incorporated county association and the second year not only maintained their three experts but also through the association purchased their spray materials at a marked reduction and marketed over fifty thousand barrels of choice fruit. Their industrial fellowships are largely responsible for having put Genessee County within two years on the fruit map of New York State.



For several years we have had reports of a destructive disease of peach trees in the peach sections of Niagara County. It is commonly known among the growers there as the European Canker, affecting the larger limbs of the trees and eventually killing them. The Newfane Peach Growers' Association was formed for the purpose of providing an industrial fellowship for the investigation of this and other diseases of the peach. In less than two years we have been able to demonstrate the cause of the disease and to locate the chief points for attack in its control.

The past season four nursery companies have united in providing a fellowship fund of \$2,600 per year for two years for the maintenance of a fellow and four assistants in the work of studying the diseases of their crops.

Arrangements are now being completed for a fellowship and field laboratory in Orleans County and also in Clinton County for the investigation and control of apple diseases.

Under a fellowship established by the Union Sulphur Company in New York City and in coöperation with certain growers who have provided orchards, etc., we have been able to undertake extensive experiments in the investigation of dusting vs. spraying for the control of certain fruit diseases, especially the brown rot of peaches and the apple scab. While neither of these diseases have been abundant since these experiments began, still we have indications of interesting results to be obtained by dusting with sulphur.

Under a fellowship with the American Steel & Wire Company we have been enabled to make investigations on the use of iron sulphate for the control of certain diseases, especially the raspberry anthracnose. These investigations are not sufficiently advanced to warrant conclusions as yet but ample funds are available for settling the question of the fungicidal value of iron sulphate, so generally recommended in Europe for certain fruit diseases, especially of the grape.

These coöperations have not been confined to fruit growers alone. By means of an industrial fellowship and coöperation of local associations of growers we have been able to meet the demand for information and assistance in the control of the hop mildew which broke out three years ago in the hop yards of the State and threatened the industry. We have met with

complete success and I believe I am safe in saying that we this season saved the greater part of the hop crop of the State from complete destruction by our advice and assistance to growers through the fellows in field laboratories in two of the largest hop growing regions of the State.

In addition to these we have, under industrial fellowships or similar financial coöperation, investigations in progress on diseases of truck crops, ginseng, florists' crops, potato diseases, etc. We are meeting to a far greater extent the demands of our growers for plant disease investigations than we could ever have hoped to do with state funds alone.

#### THE OUTLOOK.

We look forward to great growth and development of this type of coöperation not only in New York but in other states as well; not only along lines of plant disease control but also along other lines of agricultural investigation. Already evidences of this are beginning to come to our notice. We have at Cornell in horticulture, soils, and plant breeding, similar coöperative work under way. In Wisconsin the pea growers are supporting an expert at the college of agriculture for the study of diseases of field peas. This new type of coöperation, financial in nature, sound from a business point of view and most effective from an economic standpoint, has come to stay. It appeals to the live up-to-date director of investigations, it opens an unlimited field of operation and research for trained, ambitious young scientists, it provides a means by which growers with problems of pressing importance may secure prompt and effective assistance, it opens opportunities to commercial concerns with agricultural products, to extend the knowledge and use of these products to the mutual benefit of growers and manufacturer. It in no wise degrades or deteriorates scientific investigation; it stimulates, vitalizes, dignifies it. It brings to the grower fuller appreciation of the value of science in agriculture, it educates him. It brings to science the hearty espousal of its cause by the grower and the unlimited financial support which it deserves.

Gentlemen, the day will come and you will live to see it when we will have in the State of New York more than a

hundred plant pathologists working on the problems of plant diseases and their control. Already we have a fourth of that number. We propose to train these young men, our growers propose to assist in their training and to provide the financial support to retain them for service in the State of New York. We cannot afford to train them as we have in the past and then send them West or East to work for our competitors. We propose to keep them.

If you care to have further information as to our methods of conducting these coöperative investigations or to know more of the results we have obtained I shall be glad to answer your questions if I can. I thank you for the interest and consideration you have shown in listening to what I have had to offer you on this subject.

*Question:* I had the pleasure of hearing Professor Whetzel two years ago in New York when he discussed the question of apple scab in a most lucid manner, and I wish he would take just a few moments to take up direct treatment of the apple scab, its original cause and manner of control. It is a little digression from the subject and yet it is almost germane to it.

*Prof. Whetzel:* I shall be very glad of course to tell you what little I know about apple scab and its control. The apple scab is a fungous disease. A fungus is a plant which lives on dead or living plants or animals. Now this fungus plant passes the winter in old leaves of the apple on the ground. It produces what we call winter spores. They are produced in bags, eight in a sack, and in the spring they are shot from those leaves into the air. They are shot only during moist, rainy weather, and their ripening is so timed that they are ripe just at the time that the blossoms are about to open. That is to say, if the blossoms open a week earlier in a given year, the spores are ripe a week earlier, and if the blossoms open a week later the spores are ripe a week later. The same weather conditions which bring open the blossoms also ripen and bring about the distribution of the spores. There is no object whatever in spraying the trees when they are dormant for the control of apple scab. The spores are not ripe or distributed at that period. If they were distributed then there would be no place for them to find an effective lodging, because they germinate after they lodge, on the young leaves or young fruit. The first period at

which the spores are matured and bring about infection, is when the buds which contain blossoms and leaves, begin to show pink. That is the stage, just before the blossoms open, when you usually have the first infection from apple scab. The spores on the ground are shot into the air, and carried by the breeze through the orchard. Some of them falling on these leaves or blossom stalks infect the tissue, form a scab spot and bring about the injury.

Now the ideal time to make the first application for scab—you have already made the dormant spray for other things—is just when those blossom buds are beginning to spread apart; the leaves will all be turned back and the blossoms will have just pulled apart; the middle blossom at least will show pink, the others usually do. Now the ideal period does not last more than a day or two at most, so that to spray effectively, most effectively, you should be able to spray your entire orchard, or at least all the varieties that are in that condition within one or two days' time. There are very few orchardists who have orchards of any size, who are prepared to do this. We have figured that no orchardist should expect to effectively spray his trees with less than one power machine for ten acres of orchard.

• *Question:* Why not spray the ground.

*Prof. Whetsel:* Because the spores are inside of the leaves and the spray mixture will not reach the spores. The water will go through the leaf but the poisons that kill the spores will be left on the outside, filter out, and the spore case in which these spores are contained will open up and shoot the spores into the air just the same. We have found that you may soak a bunch of diseased grapes in strong blue vitriol, and it will yet continue to produce active spores. There is nothing to be gained by spraying the ground. Your first spray should be thorough and effective. It should be put on as a fine spray with at least 200 lbs. pressure. It should be put on ahead of the rain periods that come at that time, not after the rains. You should spray against the wind when you put it on. I won't stop to explain that now because it would take too long, but the most efficient way to spray is against the wind. The next application should be made just after the blossoms fall. When two-thirds of the blossoms are off the trees the average



grower should begin to spray, and if he is fortunate he may have three or four days in which to do this spraying. He may have only a day or two. He should spray the varieties that are ready to spray and not start at the north side of the orchard and spray across. If these two sprayings are thoroughly and effectively done, in most seasons only one more spraying will be required to control the apple scab, and that will be a spraying about the last of July or the first of August to catch the late infection which we sometimes have in seasons that are wet at the end,—such a season as you had this year. In some cases it might be desirable to spray ten days or two weeks after the second spraying, that is, after the spraying following the falling of the blossoms, but in New York, at least, this is not necessary. Spray with lime-sulphur 1-40, arsenate of lead 2 lbs. to 50 gals. Use high pressure angle nozzles, and high tower so as to get above the trees. You can't spray effectively and stand on the ground. We don't know anything about spraying in this country. Some of us do a fairly good job at squirting some seasons, occasionally a man has sufficient equipment to really do good work if he knew how, and a few growers really do fairly good spraying, but before we grow those fancy apples we will have to do a good deal better spraying.

*Question:* Wouldn't it be desirable to burn those leaves as they lay on the ground?

*Prof. Whetsel:* Any method of getting rid of those leaves of course in the fall would be desirable, but as a general proposition the leaves fall rather late from apple trees, they are seldom dry enough in the fall to burn and burn them all up. Any method of putting straw or similar material over the orchard and burning them is apt to injure the trees, so we have never found it desirable to undertake to control the scab in this fashion. However, growers who plough in the fall usually have much less trouble from the scab in the State of New York than those who do not plough until late in the spring. You can't depend on those things absolutely. On the other hand, there is a great deal more to be learned in the way of sanitation in the control of these diseases than we have yet discovered. Any way to get rid of these leaves is a good thing.



## GROWTH AND NUTRITION OF THE APPLE TREE.

DR. W. J. MORSE, Orono.

What I shall say with regard to the growth and nutrition of the apple tree will probably contain little which is new to those orchardists who have thoroughly studied the subject. However, my observations of the way that apple orchards are usually handled, in several different states, frequently by men of considerable experience, leads me to believe that there is much need of a more intimate acquaintance with certain fundamental principles of plant nutrition and their application to orchard practices.

A man who would hitch a cow in a wooden stanchion and then pile her rations on her back because they would thus be nearer her stomach would be considered a fit candidate for a lunatic asylum. If he should then give a flock of sheep the free range of the stable, even though he placed the fodder in reach of the cows, and expect the sheep to get their living upon the same food supply and the cows to remain in good condition and give a full flow of milk we would place him in the incurable ward. Yet he differs but little from the man who places his fertilizer only around the bases of the tree trunks or from the man who expects his trees to grow strong and vigorous and produce an abundance of large apples, and at the same time is not satisfied unless he yearly secures a full crop of hay from these same orchards. In the first instance he should not be too severely censured. He shows an honest desire to give the tree something in return for what it gives him and is placing this food material where he thinks it is most needed, therefore the comparison is to a certain extent unfair. It does not take a very bright man to discover the business end of a hungry animal but to the uninitiated it is not so easy to locate the millions of tiny feeding organs of a hungry plant. On the other hand I maintain that the man who expects his

orchards to produce paying crops of both apples and hay upon the food supply and care which should be given for one crop alone, is on a par with the man who expects to maintain his herd of cows and flock of sheep upon the rations of one.

These statements should not be taken as implying that good crops of apples cannot and are not often obtained in New England on well fertilized and otherwise well cared for orchards in sod. It is also admitted that some of the most highly colored fruit is obtained in this way. However, carefully conducted experiments go to show that to secure the most profitable returns year after year the orchardist should not rob his bearing trees of food materials by trying to produce other crops, especially hay, on the same land at the same time.

Before I attempt to discuss the more fundamental questions of how the tree takes up the crude food materials from the soil, transports them to the leaves to be manufactured into plant food, and then transports this elaborated or manufactured food to the various organs of the plant to nourish and build up the tissues, I wish to call your attention to some practical results which we have obtained at Highmoor Farm from cultivation, fertilization, pruning and spraying, and I hope to make clear, before I finish, that all of these have a more or less direct bearing upon questions of nutrition and growth.

Highmoor Farm was purchased by the State in 1909 and came under the management of the Maine Agricultural Experiment Station that summer too late to do much that year. Originally there had been 5000 trees but for various reasons, chiefly through neglect by certain of the previous owners, the number had been reduced to about 3100. Many of the remainder had been badly injured by borers and winter killing, and fires started by railroad locomotives had been allowed to run through a part of the orchards at various times. All of the trees were in a semi-starved condition, sadly in need of pruning, and there was little evidence of previous cultivation. After determining which trees were in a hopeless condition the number was reduced to 2300 in 1910. The trees were about 20-25 years old in 1909.

I cannot take the time to go into the details of the treatment which these orchards have received since the Station assumed control. Briefly, in 1909 they were sprayed once in late spring,

just as soon as the purchase of the farm was assured, largely to control leaf-eating insects which were present in great numbers. The purchase was completed too late to begin cultivation that year, but 300 pounds of commercial fertilizer was applied per acre as a top-dressing and pruning was begun as soon as possible. Since then all of the orchards except certain plots left for comparison have been brought under cultivation and each year sown to a cover crop after mid-summer. They have been liberally dressed with commercial fertilizer. In the spring of 1910 one thousand pounds of lime per acre was worked into the soil to correct acidity. Pruning has gone on each year to remove surplus, dead and diseased wood, and to open up the tops to admit the sunshine. By repeated examinations borers have been hunted out and destroyed. Since 1909 the main orchards have been sprayed at least three times each spring. In 1909 and 1910 bordeaux mixture and arsenate of lead were used in the main orchards but lime-sulphur and arsenate of lead have since been used and will continue to be used unless something better is obtained. While bordeaux mixture is a very efficient fungicide, the Ben Davis and Baldwin, which varieties constitute the major portion of the orchards at Highmoor Farm, are very susceptible to injury from this spray.

Unless one has had experience in similar work in orchard renovation the results obtained are a little short of marvelous. Many here have seen these orchards the present season and before the Station took control. Others have been in the orchard this summer and have seen the plots which have been fertilized, sprayed, and pruned but not cultivated and along side the plots which, in addition to this, have been thoroughly cultivated. In one case the fruit was scanty and undersized and the leaves were light green and small, while in the other the fruit was good sized and abundant and the leaves were large, vigorous and of rich deep green. To one who has not seen the orchards the annual yield of fruit since the Station assumed control of the farm tells the most convincing story.

In 1909 thirty-one hundred trees produced two hundred barrels of fruit, of which only ninety were merchantable. In 1910 twenty-three hundred trees produced 350 barrels of which 275 barrels were merchantable. In 1911 twenty-three hundred trees gave a total yield of 2,450 barrels of which only 114 bar-

rels were classed as culis. The season of 1912 gave the greatest surprise of all, for no one connected with the farm anticipated that trees which were in the condition these were in 1909 and which gave a large crop in 1911 would show a still farther increase in yield of 750 barrels. The figures just obtained for 1912 show a total yield of 3,200 barrels of which 2,950 were merchantable. The percentage of merchantable apples would have been greater this season if continued rainy weather had not prevented the application of the lime-sulphur spray on a part of the orchards before the blossoms opened. Experimental work conducted this year showed that for the present season this application was probably more effective in preventing scab than all the others combined. It also may be remarked in passing that the use of lime-sulphur in place of bordeaux mixture in 1909 and 1910 would doubtless have given a slightly greater percentage of merchantable apples, but this would not have influenced the total yield materially, which depended to a large extent on the nutrition of the trees.

Before leaving the discussion of the practical results obtained at Highmoor I wish to state that the growth of the trees has more than kept pace with the increase in production of the fruit. This is particularly evident in the Baldwin orchard where the trees were especially unhealthy looking and stunted when the Station took control. Some of these trees appear to have nearly twice the spread of limbs that they had three years ago. This may be illustrated by the life history of two small branches taken at random in this orchard a few days ago. The first was put forth from the main branch in 1905. In 1906 it grew two and three-quarters inches, in 1907 four and one-fourth inches, 1908 four and three-fourths inches, 1909 five inches, 1910 three inches. In 1911 came the real response to the new method of treatment when it elongated and matured seventeen and one-fourth inches of new wood. The present season it has done nearly as well and although weather conditions have not been so favorable, the growth has amounted to sixteen inches in length. In other words in 1911 and 1912 this limb gave an average annual growth which was more than three-fourths of that of the five preceding years taken together. The other limb is two years younger. In the three years 1908 to 1910 inclusive, the entire growth in length was only eight and



one-half inches. In 1911 it was twenty and three-fourths inches and in 1912 nineteen and one-half inches, or an average annual increase of two and one-half times that of the three preceding years combined. It should be remembered that, as has been previously stated, these trees have produced in succession two fair crops of apples while making this growth. It should also be remembered that during the last three years they have not been competing with a hay crop which would eat up the food materials and make great demands on the water supply just at the time that the trees needed it the most. The only thing which has been grown in the orchards aside from apples has been a fall cover crop which has been plowed under the following spring.

It is the common practice to speak of the ordinary natural and artificial fertilizers as plant food. Strictly speaking this is incorrect. Fertilizers furnish some of the crude food materials which the plant takes in along with water and certain other materials dissolved in water. From these and with the carbon dioxide gas from the air and through energy obtained from the sun's rays it builds up food substances suitable for the nourishment and growth of its various tissues. There are certain chemical elements such as calcium, magnesium, sulphur, iron, nitrogen, phosphorus, and potassium which must be present in the soil to properly nourish the plant. The most of these are present in ordinary soils in sufficient quantity but the supply of nitrogen, phosphorus and potassium is not usually sufficiently abundant to withstand repeated cropping so that they must be replaced by some means or other. All complete artificial fertilizers contain each of these elements in some form. The active, living part of the plant cell in which the work of food manufacture goes on is a nitrogenous compound. Potassium is presumably active in assimilation or the absorption of carbon from the air and in the formation of this living substance, while phosphorus and sulphur rank with nitrogen as important constituents of it. Until quite recently it has been taught that sulphur was present in ordinary soils in sufficient quantity for plant growth. The work of Hart and his associates at the Wisconsin Experiment Station and that of certain German investigators raises a question as to the soundness of this teaching and it is possible that in the near future the use of



sulphur as a fertilizer may become a common agricultural practice. As a matter of fact sulphur is a constituent of certain of the compounds ordinarily used in commercial fertilizers such as potassium and ammonium sulphates.

We are apt to regard the soil simply as a storehouse for plant food materials but we lose sight of the fact that much of this food material is not in condition for the plant to take hold of it. It is, as we say, unavailable. How does it become available? Through the activities of millions upon millions of minute living organisms. What do these organisms do? Under favorable conditions they are constantly at work tearing down the more complex organic substances such as those which make up the tissues of the cover crop which is plowed under in the spring, or the stable dressing which is applied, or any other animal or vegetable substance in the soil, and converting what otherwise would be absolutely useless to the plant into more simple chemical compounds which it may readily absorb through its roots. What are favorable conditions for their work? The presence of an adequate supply of moisture, food, air and warmth and an alkaline condition of the soil. How are these conditions best supplied? By cultivation and increasing the humus content of the soil by plowing under cover crops and the application of stable dressing or other fertilizer and liming where necessary.

Thus we have seen that the soil of the orchard is not only a storehouse for plant food materials but that it is a vast manufactory filled with tiny machines, each working day and night when conditions are favorable, turning out a product which the tree can use to build up into food for its tissues. These processes go on most actively in the spring and early summer. The cover crop which served its purpose the fall before in checking too long continued growth and the production of immature wood, prevented washing by fall rains, and helped to protect the roots from the rigors of winter. It also stored up in its tissues some of the available food materials of the season before which would have been washed away and lost. When turned under in the spring it at once furnishes food for these beneficial soil bacteria to grow upon and multiply and to convert into substances which may be used by the trees. It tends to lighten the soil, and to admit the air which is also essential

to their activities. From its nature it increases the water holding capacity of the soil, which not only benefits the soil bacteria but also is of the greatest importance to the trees when the dry summer months come on and large demands are being made upon the soil for water to develop the growing leaves, wood and fruit.

So much for the cover crop—now wherein are the benefits of cultivation? It is well known that a heavy soil is cold and that the lighter and more porous it is the warmer it is. A soil that is frequently stirred is better aerated. Frequent cultivation tends to break up capillarity and consequently helps to prevent losses of water from the soil by evaporation. Cultivation also makes the particles of soil finer and thus allows more ready access to the materials it contains. Hence we see that cultivation does much to produce the right conditions under which these beneficial soil bacteria are able to do their work.

The higher plants with green coloring matter, to which class the apple tree belongs, differ from animals in that they are able to build up from comparatively simple chemical compounds, with the aid of this green coloring matter and the energy obtained from sunlight, the quite complex food substances necessary for the repairing and building up of tissues and the carrying on of various other vital processes within the plant. Before we can intelligently discuss how the apple tree does this and what bearing it has on a rational system of orchard management we must know something of the structure of the various organs of the tree.

All plants are built up of cells and these are of different kinds and shapes and they are variously modified according to their functions. The essential parts of a plant cell of the class to which the apple tree belongs consist first of a cell wall made up largely of a substance called cellulose which is readily permeable to water. It contains identically the same chemical substances and in the same proportions as starch but differs from it in the way these substances are combined. Filter paper or raw cotton are almost pure cellulose. In woody tissues and bark the cell walls have become much altered through the deposition of other substances. Within the cell wall is the living substance called the cytoplasm or protoplasm. This is a nitrogenous or albuminous substance more closely resembling the

white of an egg than anything else we meet with in every day life. Except in the youngest cells this cytoplasm forms a thin layer just within and in close contact with the cell wall, and in it the different processes of food manufacture, transformation and nutrition go on. Imbedded in it are various small bodies called plastids. Some of these are known to perform certain definite work in the cell. Two classes of these which are very much alike in many ways are of especial interest to us. The green ones or chloroplasts which are so abundant in the cells of the leaves as to give them their green color are the bodies which are concerned in the manufacture of starch. Other colorless ones in cells in other parts of the tree or in portions of the trunk and roots are the agents which store up the starch in those cells for a future food supply. The cavity within the cell is filled with the cell sap which consists largely of water with other substances in solution. Somewhere within the cell, sometimes suspended in the cavity or often at one side, but always connected with the layer of cytoplasm within the cell wall, is a very definite body called the nucleus. While this in many respects is by far the most important of all the parts that go to make up the cell, in that it is considered by many to be the controlling factor in the various vital activities of the cell and plays a very important role in the transmission of hereditary characters, it is not necessary for our present purpose to discuss it farther.

The cells which go to make up the root hairs are long and slender and are very thin walled. Those which go to make up the tissues of the root, trunk and branches are variously modified. Many of the wood cells are long and slender with pointed ends which overlap each other, breaking joints, and thus giving strength. In other cases the end walls of larger cells in the woody tissues disappear along with their living contents. To all intents and purposes much of the interior of the trunk is dead tissue, but it is by no means functionless. The disappearance of the end walls of the large cells leads to the formation of large tubes or ducts, running up and down the stem, and these serve a most useful purpose in helping to provide a passage for the food materials in solution from the roots below to the leaves above. They may be roughly compared to a system of pipe lines. Some of them are curiously pitted while others are

strengthened by a spiral arrangement which reminds one of the metal reinforcement used on lines of rubber hose designed to withstand great pressure, only the spirals are on the inside rather than on the outside of the tube. It must not be assumed that the tissues of trees are not subjected to considerable pressure from this upward flow of sap. On a steam gauge attached to a maple tree I have obtained a pressure amounting to twenty-five pounds to the square inch.

Running radially out from the center of the trunk are rows of short cells whose shape and arrangement may be likened to a brick wall. These cells remain alive much longer than many of the woody cells which adjoin them, and they serve to unite all the separate living tissues of the stem. They are active in transporting food materials from the outside inward and are connected with the water conducting elements and serve as storehouses for starch, etc. They form the so-called medullary rays which are quite prominent in cross sections of the trunks of certain kinds of trees. Just within the bark is the cambium ring composed of a layer of cells which are in active division as long as growth is taking place rapidly, especially in the spring. It is here that growth in thickness takes place. This explains why in grafting it is absolutely essential in order to secure a perfect union that the inner line of the bark of the scion should exactly coincide with that of the stock. In budding the little ring of exposed cambium tissues is seated in direct contact with the outer layers of the same tissue of the stock. Hence ideal conditions for a union is thus provided.

In the leaves the shape of the cells and their arrangement may be compared to the stones of a loosely piled stone wall, but there is a certain amount of order and purpose to it. The upper and lower surfaces of the leaves are covered with a definite protective layer of cells, called the epidermis. Scattered through this are many little mouth-like openings called breathing pores or stomata. These openings are surrounded by two peculiarly shaped guard cells which remind one of lips. These guard cells are so constructed that they automatically open apart when the leaf is turgid with water and close together when the reverse is the case. The breathing pores not only serve as avenues for the escape of watery vapors from the interior tissues of the leaf but also for the escape of oxygen gas which is a by-product in



the manufacture of starch and allow for the entrance of carbon dioxide gas from the air which is absolutely essential for the manufacture and production of starch, sugar and other carbonaceous compounds used in the nutrition and growth of the tree. It will be seen that the loose, spongy nature of the leaf tissue is adapted to these processes also.

We are now ready to start with the simple food materials in the soil which have been supplied by means of chemicals or which have been produced by the breaking down of organic matter in the soil and its conversion into available form by the soil bacteria, and follow their course till they are built up into the tissues of the tree. In the first place they must be in solution. This requires the presence of an adequate supply of soil water which may not be present during the driest summer months unless evaporation has been retarded by means of frequent cultivation. The root hairs give off an acid secretion and it is generally thought that this assists in dissolving and bringing into solution certain mineral food substances.

Now having the plant food materials in available condition and in solution, how does the apple tree take them up? The natural answer is, by means of the roots, but if you press the question farther and ask if all of the roots or only certain parts of each root function in this matter I venture to state that the average individual has rather hazy ideas on the subject. As a matter of fact the entire process of absorption of these food materials in solution takes place in a very limited portion of the roots and is confined largely to the root hairs. Root hairs occur in only one narrow zone and this is just back of the growing point at the end of each and every tiny rootlet. Knowing this fact we can appreciate how very important it is in transplanting trees that these small rootlets are not broken off and are disturbed as little as possible if the tree is to go on growing without a serious setback. And knowing this fact also it is not at all surprising that so many young orchards come to grief the first year, and infant-tree mortality is so large. Another important lesson which this fact teaches is that the man who distributes his fertilizer only closely around the tree trunks could not place it in a more inaccessible place so far as the majority of the organs of absorption are concerned if he sat up nights and worked over time trying to devise a means of so doing. Hence



to place the food materials where they will do the most good they should be distributed all over the ground shaded by the foliage and particularly upon the outer portions of this area.

After the solutions of food materials are absorbed they pass along to the cells adjoining the root hairs and then upward through the roots and trunk and branches in the wood inside the cambium zone, and then outward into smaller and smaller branches till they reach the leaves. These are the laboratories of the tree where the actual manufacture of the food for the nourishment and building up of the tissues takes place. In these leaf laboratories the more simple chemical compounds brought up in solution from the soil are combined with some of the water itself and with the carbon dioxide of the air into the much more complex food substances. Sunlight is the ultimate source of energy for this process and it cannot take place without it.

Thus we readily see the necessity for pruning. While pruning is of great advantage in removing dead, diseased and surplus wood and in providing opportunity for the better coloring of the fruit, it is absolutely essential to ensure the most efficient and maximum production of food substances. In a thick topped apple tree only the outer leaves receive the full rays of the active summer sunlight. Those within are so shaded that they fall far short of working to their full capacity and almost may be classed as non-producers in this great leaf community of plant-food manufacturers. Moreover such leaves must of necessity be weaklings for their own tissues are dependent for nourishment upon the food which they manufacture. The apple scab fungus which is one of the greatest enemies of the apple tree in Maine finds among them the ideal conditions under which to gain a foothold. This fungus loves shade and moisture, while free access of sunlight and the free circulation of air through the tree-tops are of great assistance in keeping it in check. It more readily attacks the leaves that are in a weakened condition and a leaf so attacked rapidly loses its food manufacturing ability. Hence the attacks of apple scab indirectly deprive the tree of its tissue building materials.

A well pruned, well shaped, open-topped apple tree allows the admission of sunlight to all of the interior portions. The limbs are so arranged that the maximum number of leaves are exposed to the source of energy and they are thus worked to

their full capacity. This same arrangement also provides less favorable conditions for the development of scab and it also facilitates the application of protective sprays to the interior portions of the top.

Starch is of almost universal occurrence in green plants and is an important plant food. That it is manufactured in the green leaves and only in the presence of certain active rays of a beam of sunlight is a fact easily demonstrated by any school boy. While starch is constantly being formed when the sun is shining on a green leaf it is in the form of grains and not in solution. By other agencies it is constantly being converted into closely related soluble substances like sugar and transported to other parts of the plant. There it is either used at once or converted into starch again and stored till future needs require it. The potato gives a familiar illustration of this. Here the food material manufactured by the parent plant the season before is stored up in the tuber ready to be used as a source of nourishment for the young plant till it has developed a root system of its own and is able to shift for itself. This transformation and removal of manufactured starch goes on throughout the night. Hence the leaf that at the close of a sunny day was gorged with starch begins the new day with a clean slate ready to repeat the process of manufacture.

The plant manufactures starch from the elements supplied by carbon dioxide and water alone and releases oxygen in the process, which escapes through the breathing pores of the leaves. The albuminous substances which go to make up the living cytoplasm of the cell contain in addition to the chemical elements found in starch, nitrogen, sulphur and phosphorus. In the formation of albuminous substances it is generally held that a part of the starch is first converted into some other form of carbohydrate and that this is in some way combined with the other elements mentioned.

The course of the long distance transport of the elaborated albuminous food substances in passing back down the branches and trunk differs from that of the upward current of crude materials in that it is carried down in the innermost but living portions of the bark just inside of and in contact with the cambium zone or region of growth. When we know the path of

the upward passage of crude materials and the downward course of the elaborated food we are able to explain many common observations in the orchard. Thus we can readily understand why, if the wood is sound, a tree may go on growing for some time or sometimes recover after it has been nearly or partially girdled. However, if not enough manufactured food can be sent back down to nourish the roots they will gradually lose their power to take up crude food substances from the soil and the death of the tree will result. When we resort to bridge grafting we are simply putting in what may be called an artificial pipe line to bridge the gap and in this way convey manufactured food down to the roots that they may be suitably nourished and thus be able to perform their proper function.

Before closing I wish to call attention to one more practical point. In pruning fruit and shade trees it is practically impossible to get the majority of people to make the cut at the proper place. From what we have learned regarding the course of the downward movement of the elaborated food materials, the region of growth and consequently the region in which new tissues must be formed for covering wounds, it is perfectly evident that the cut must be made parallel with and as close to the main trunk or branch as it can possibly be made. The surface must be smooth and no projecting edges of wood left at the margins of the wound to prevent the new tissues from closing over it. Such a wound will completely heal in due time, provided the exposed wood is properly protected with a coating of pure white lead and linseed oil. A cut made farther away from the main trunk or branch makes a much smaller wound but such a wound either never heals at all or if it does heal it takes much longer than when the cut is properly made. Frequently the bark extending out beyond the line of the trunk dies away, leaving an unsightly stub which later decays, and the decay thus started is communicated to the interior of the trunk, leading finally to the decay and death of the tree. Many orchards have been converted into graveyards through the lack of observation and the ignorance of fundamental principles of growth and nutrition, as applied to apple trees, on the part of men who pruned them or failed to prune them.

## THURSDAY AFTERNOON.

## GREGORY ORCHARDS.

## THEIR SOURCE AND AIM.

By A. K. GARDNER, Augusta.

As a result of the New England Fruit Show held in Boston in October, 1909, Mr. James J. H. Gregory of Marblehead, Mass., gave to the State of Maine a \$1000 first mortgage bond, with the provision that at intervals of five years \$200 of the interest should be paid to the orchardist who could show to a committee of three the most excellent orchard of one acre or more grown on his own land, of trees of his own selection (the Ben Davis excepted) five years from setting; the first planting to be in the spring of 1910 and judged in 1915. This most generous offer of Mr. Gregory's induced others to offer like premiums as follows:—

Premium by a friend .....	\$150
Bowker Company .....	100
B. G. Pratt Company .....	100
Douglas Pump Company .....	100
Deming Pump Co., Salem, Ohio .....	50
Charles J. Jager Co., Boston, Mass. ....	50
Portland Farmers' Club .....	50

This great movement received the hearty support of many of our leading orchard men throughout the State, with the result that a large number entered for the contest, and names were being booked for the acre or more of standard apple trees. Information regarding this contest was published and distributed as follows:—

“Although we do not wish to issue cast-iron rules or provide for a whole lot of red tape, we do believe that if we are in the forward movement for better fruit for Maine, and if we would place our fruit on a par with that of our western neighbors, we must adopt the best methods known to the fruit industry. We must gain the confidence of our commission men and the consuming public before we can hope to make a success with our apples. Our first duty is to thoroughly renovate our present orchards and then enter this contest to show that we believe in the possibilities of our Maine grown apples. We have the best of soil, as good a climate as can be found, for many choice varieties, and one of the best markets of the world at our very doors. Why should not Maine lead in this important industry that means so much to the health as well as profit of our people?

We will outline some of the essential points to be considered in entering this contest.

#### SELECTING STOCK.

It is left with each contestant to make his own selection of any standard varieties, the Ben Davis excepted. Of course much depends upon the right selection. If one wishes for a home orchard alone, he wants to select those varieties that appeal to him or his family, for we do not all have the same taste in this regard; but one should use his best judgment and select those that would give fruit for the table from early fall to late summer. This would require but few varieties, providing they were well selected. If a commercial orchard is planned, and that is what is most desired in this campaign, we would recommend but one variety, providing it be a strong polenizer; if not, it would be well to set every fifth row to some variety that blossomed at the same time and was rich in pollen. Those who enter this contest should plan to make this acre the nucleus of an extensive commercial orchard and start where additions could be made from year to year as desired.

This stock should be of the first quality, preferably two years old, straight, of good top formation and with plenty of roots. It is very essential that stock be selected at the earliest possible moment, as there is a great scarcity of standard apple trees in the market.”



At the end of the season, report sheets were sent to each contestant calling for name, address, location of orchard, slope, soil, previous soil management, variety or varieties, use,—commercial or home—distance apart of trees, fertilizer, amount and cost, crop raised, cost of production, amount of crop, value of same, cost of trees, expense of setting, expense of care and amount of growth.

It was believed that by covering the ground thoroughly, definite and valuable data could be obtained regarding adaptability of variety, best methods of pruning and management and the necessary costs in setting an orchard and bringing it into bearing.

The orchards were visited by a member of the Department and advice as to pruning, etc., given to each grower. Unfortunately, this advice was not followed as carefully as it should have been, in a great many cases. When the returns came in, it was found that one hundred seventy-eight (178) growers had entered the contest. Most of the questions were fully and comprehensively answered, but those relating to costs were disappointing and showed lack of business methods in the management. Some of the compilations regarding the reports have been made up and are given below.

The orchards are located in Counties as follows:—Androscoggin, 26; Cumberland, 9; Franklin, 13; Hancock, 9; Kennebec, 16; Knox, 8; Lincoln, 9; Oxford, 19; Penobscot, 15; Piscataquis, 10; Sagadahoc, 6; Somerset, 9; Waldo, 17; Washington, 7; York, 5; Aroostook being the only county not represented.

As regards variety, Stark leads slightly over the McIntosh in number of times planted. Stark, 50; McIntosh, 49; Baldwin, 31; Wealthy, 23; Wolf River, 18; Spy, 17; Tallman Sweet, 13; Arctic, Gravenstein and King, 8; Delicious, Dudley Winter and Gano, 7; Banana, King David and Rhode Island Greening, 6; Senator, 5; Longfield and Rolfe, 3; Alexander, Baxter, Bellflower, Hubbardston, Jonathan, Maiden Blush, Milding, Opalescent, Paragon, Red Astrachan, Wagener and Wismer, 2; America, American Blush, Arkansas Red, Beitegheimer, Black Ben Davis, Dutchess, Fall Pippin, Ohio Nonpareil, Pewaukee, Stayman, Spitzenburg, Walbridge and York Imperial, 1. The large

number of varieties planted may be accounted for in that many of the orchards are for family use.

The distance apart varied somewhat, the popular distance being two rods each way.

48 were set	33 x 33
33 " "	30 x 30
30 " "	40 x 40
16 " "	35 x 35
6 " "	30 x 40
4 " "	35 x 40
4 " "	36 x 36
2 " "	27 x 27
2 " "	30 x 35
2 " "	25 x 25
2 " "	6 x 6†
1 was set	20 x 20
1 " "	30 x 33
1 " "	34 x 34
1 " "	25 x 35
1 " "	28 x 28
1 " "	33 x 40

As regards method of handling:

87 were cropped
20 were in sod
15 were in grain
6 were in pasture
4 were clean cut with cover crop
2 were in clover
2 were mulched
1 was pastured to hogs

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†Transplanted later.

	COST OF TREES.		COST OF SETTING.	
	Average per A.	Average per tree.	Average per A.	Average per tree.
Androscoggin.....	\$14 48	\$. 407	\$2 95	\$.09
Cumberland.....	11 35	.249	3 14	.068
Franklin.....	14 22	.335	2 94	.063
Hancock.....	16 77	.418	5 07	.112
Kennebec.....	15 06	.372	2 57	.059
Knox.....	15 06	.415	3 35	.092
Lincoln.....	26 37	.608	2 53	.058
Oxford.....	16 23	.354	4 62	.093
Penobscot.....	11 89	.392	3 49	.115
Piscataquis.....	15 79	.370	3 88	.100
Sagadahoc.....	18 41	.447	3 83	.093
Somerset.....	15 11	.386	3 33	.085
Waldo.....	11 40	.284	3 03	.065
Washington.....	17 07	.591	5 16	.153
York.....	13 05	.390	3 77	.090

Highest cost of one tree.....	\$1.94
Lowest cost of one tree.....	.10
Average cost of one tree.....	.387
Highest cost of setting one tree.....	.25
Lowest cost of setting one tree.....	.015
Average cost of setting one tree.....	.085
Average cost of one acre of trees.....	\$15.24
Average cost of setting one acre.....	3.44
Largest number of trees per acre.....	109
Smallest number of trees per acre.....	27

Last fall, the reports were sent out again, asking many of the former questions and in addition, spray materials, trees re-set and the cause of death.

Twenty-four of the original contestants failed to send in any data and have been dropped from the list.

The second year reports proved very interesting and in general were satisfactory. The cost of handling again furnishing the disappointing feature.

Four hundred sixty-nine (469) were killed during the first year; 110 by mice, 132 by winter-killing and canker, 38 by failure to start, 25 because of poor stock, 12 by poor root systems, 35 by unknown causes, 37 by snow and ice, 16 by deer, 50 because of the extremely dry season, 4 by carelessness in driving, 1 by scale, 1 by borers, 1 by rabbits, 4 by tarred paper and 3 because of woolly aphis.

This loss must comprise nearly 1-12 of the total number of trees and plainly indicates that the locations were either very unfavorable or that the method of handling was at fault.

The cultivation methods were very similar to the first year; most of the orchards being cropped to garden truck, corn and potatoes.

There were not as many who practiced spraying as had been anticipated, especially the sprays for aphis. These lice were prevalent in nearly all the orchards and were damaging the growing tips to a great extent. As the spray is simple to make and easy to apply, the fact that it was not used is the more surprising.

Sixty-nine (69) of the orchards received no spraying whatsoever. Bug death was used in two, Paris green in two, lime-sulphur in thirty-eight, whale oil soap in six, arsenate of lead in thirty-four, kerosene emulsion in nine, tobacco infusion in eleven, Pyrox in twelve, Bordeaux Mixture in sixteen and Bordo Lead in one.

#### THE OUTLOOK.

The inspections this season have shown that only a comparatively small number of the orchards will offer keen competition for the prizes.

What are the reasons for this? They are many. That it is not due to climate conditions is demonstrated by the fact that many of the best orchards are widely scattered, or to soil by the fact that orchards in the same neighborhood under similar soil conditions vary greatly.

It would appear then that the variations are due, first, to poor stock, and second, to lack of care. As the majority of the original stock averaged over forty cents per tree, the cause of this variation would seem to be elsewhere.

Lack of proper care is the important fault with these orchards.

1. Lack of time.
2. Nonappreciation of the advantage of proper pruning, spraying and growth.

Unfortunately for our fruit industry, the majority of our growers relegate the orchard to the background and allow it to play second fiddle to the other crops on the farm. The expression, "I didn't have time as other work interfered," is so common that it has become monotonous.

If we are to put our orchards to the front where they rightfully belong, we can't allow other work to interfere. The trees must be of paramount importance if we are to successfully compete with the growers of other sections.

#### PRUNING.

A sturdy tree that is capable of supporting fruit is the tree we desire in the orchard and to get this tree we must prune the young tree carefully and systematically. A certain amount of heading must be carried on both at the time of planting and later, removing branches that are not desirable and prevent a well balanced top.

We need a tree here that has at least a moderately open top, as the short season and lack of sunshine tend to produce poorly colored fruit. The impression that a low head interferes with cultivation, weakens the tree by starting it high and having the branches come out too near together.

Many varieties, unless headed back, produce long, weak branches with little bearing surface, which are not desirable.



Inspectors have dwelt upon these points each year, but there seems to be little inclination to carry them out on the part of some of the growers.

#### SPRAYING.

It is an established fact that a certain amount of spraying aids materially in the development of the young tree. Scale insects sap the strength from the growing tissue in the main limbs and trunk; aphids check the terminal growth and curl the leaves by sucking the juices from them. Scab and fruit spot cause the leaves to fall prematurely before they have thoroughly completed their function and leaf-eating insects often defoliate the trees leaving them without what we may term their lungs.

No young tree can do what it is capable of, if these pests are allowed free rein and the extra expense incurred in their suppression will be more than offset in the more rapid development of the tree itself.

#### GROWTH.

Many trees have been driven too fast, resulting often in winter-killing; others have not had sufficient food, resulting often in canker, which they are too weak to resist.

Where nitrogen has been used extensively, especially as nitrate of soda, the wood has not sufficiently ripened in the fall to withstand the severe cold during the winter and the trees have killed back badly.

Just how fast a tree should grow must be judged mainly by its appearance and not by a set fertilizer formula. Early forcing hardly ever pays in the long run. In general the orchards that are receiving cultivation, either through garden crops or cover crops, are doing better than those in soil, even though the latter are receiving applications of commercial fertilizer.

The orchards in grain suffered more than the others, especially a year ago when the soil became so dry. Oats especially should be planted elsewhere.

As regards growth, I would say, prune out the branches that are unnecessary to the framework and weaken it; spray so that the tree may be healthy and capable of doing its best; keep

down invading grass and weeds during the growing season; feed the tree carefully and see that the growth is checked so as to allow the maturing of the wood before the cold weather comes.

In many of the Gregory orchards this management has been carried on and the results are clearly manifested.

Let us hope that in 1915 when the second orchards are set, more men will enter the contest and go in with the firm determination that theirs shall be the best, not necessarily the most expensive, for the question of economy enters the competition, and that other crops will not interfere with that work which is the most pleasant and profitable if rightly carried on.

## RESULTS IN 1912 AT HIGHMOOR FARM.

---

By G. A. YEATON.

*Mr. President, Brothers and Sisters of the State Pomological Society:*

You have been talked almost to death. Everybody has talked to you. They talk to you downstairs. They talk to you upstairs. They have played the organ, they have done almost everything, and the only hopes that I have of your staying here is that the door is going to be locked so that you can't dodge. But I will tell you another thing, that I am not going to make any long talk at all, for I realize the fact that you are very tired indeed and that it has been a strenuous week for us all. Unfortunately I have not written out any of the talk that I am going to make. It is simply facts as they have been presented to us through the orchard that I am going to talk to you about.

In the first place Dr. Morse reviewed the situation very thoroughly this morning. The very best that I can do is practically to give you a repetition of what he said. I am going to tell you some of the things that have been accomplished.

When the State took over the farm three or four years ago the orchard was in a very serious condition indeed. It was on the verge of collapse. The trees had been neglected. Many of them had made but a trifling growth for a number of years previous. The roots were just barely holding the life in the tops and not making any growth whatever, just simply existing, lingering at this poor dying rate. The State took them over and commenced to fertilize, prune, spray, and cultivate, and did a work of regeneration. To prove that that was the right thing to do,—the first crop was less than 200 barrels and of that only

ninety barrels were merchantable. The next year we got a little better crop. The only note that I have made was the number of barrels, and that is so very important, illustrating thoroughly the value of cultivation, pruning and spraying, the treatment that the orchard has had, that I am going to read from my notes. In 1909 there were 200 barrels of which 90 were marketable apples. In 1910, 350 barrels were produced, of which 275 barrels were put into the market. In 1911, 2400 barrels were raised, and 2300 were put into the market. In 1912 the grand total was 3217, of which 2750 were fancy No. 1 apples, packed so that the members of the Pomological Society would be proud to have any one inspect them as he would see a pack that was a credit to all, and the whole State of Maine, because it is an object lesson, and we say the main feature that we are endeavoring to bring out at Highmoor Farm is the value of an object lesson, to induce others to go and do likewise. Now to bring these results about we have used systematic spraying, fertilizing, pruning and cultivation. We found this year that in order to cultivate more economically than we had in the past, it was advisable to get a traction engine or a motor plow. The trees are set in rows twenty-five feet apart each way. You will understand that that is so close together that the limbs come very near together in the center, making it almost impossible to cultivate with a team; especially if you are using 1600 lb. horses. So the Station bought a traction engine or motor plow and the plowing between the rows as far forth as we could was done with that, and then a disc harrow was attached to the corner of this auto plow which allowed us to cultivate close to the trees. That has been done a great deal more economically than could possibly be done by the horses with the old fashioned method. One can run the engine, one taking care of the harrow, either the disc or the spring tooth, and guiding it up close to the trees. It saved a great deal of expense and the result has been phenomenal. The trees, without any more fertilizer than has been used in years past, have made a wonderful growth, the leaves are in a better, more healthy color than they have been in the past, and the orchard is really coming along very nicely indeed.

Now when the Station took this farm over, the mice had worked there a good deal and many of the trunks of the trees

were girdled part way round, some of them more than three-quarters of the distance. This past season in one of the orchards we have been doing some tree surgery. We have cut out the diseased wood so as to get down to the clean wood in order to make a good healing, and then have filled those with cement. We are intending, and probably it will be carried out next spring, to bridge graft below, starting in below where the mice have girdled and inserting the scion below. While it is of course going to be a great deal of injury, as it has set back the tree in its productivity quite a good deal by the loss of the flow of the sap, yet we believe that by bridging that over we can induce that tree to bear the normal crop again. Those are some of the few things that we are trying to demonstrate to the people that it is feasible to do.

Now in almost all of the orchards we have given absolutely thorough cultivation from the early spring until about the middle of August. In one of the orchards we have left, partly from necessity and partly for an experiment, a piece around the tree four feet. We plowed up to four feet each way. There is an eight foot space, four feet from either side, and where it has been plowed both ways there is really a circle of eight feet around the tree that has not been cultivated, and where the trees have had a thorough, clean cultivation in the rows adjoining those with the eight foot space, we can see by the new growth this year that it has made quite a good deal of difference. Where there was clean cultivation there has been from two to five inches more growth. Now that may seem to you a small thing, two to five inches, but when you consider that the average growth of our orchards throughout the State is only about eight inches, you will see it is really a phenomenal growth. And that has been accomplished more through cultivation than it has from the fertilization.

The fertilizer experiments have been as follows: In No. 1 orchard, the first four rows this year had no fertilizer whatever; the next four rows, 500 lbs. of the commercial fertilizer which analyzes 4-8-6,—nitrogen 4, phosphoric acid 8, potash 6; and the next four rows had a half a ton of that same grade. That is the grade of phosphate used this year in all of our orchard work. This year with the cultivation that we have given the



orchard, it has not shown in new growth or the size of the apples where the fertilizer was applied. Whether there was no fertilizer applied this spring, 500 lbs. or a thousand pounds, we practically got the same results. Now that does not prove one single thing to us because since the Station took over this farm the trees have had thorough cultivation all the time. But in time to come, it will show us whether we have got to fertilize more, or whether we can curtail the expense by cutting out a part of the fertilizer, or whether we have got to increase our fertilizer to get the best results.

Now for the practical orchard man we have got to have the results. Those of you that were in to hear Bro. Hale last night heard him tell us that we had got to figure it so fine, if we were going to have the balance on the right side of the sheet, that we had got to cut out an eighth of a cent here, a quarter there, two cents on the package--we must cut our expenses down if we are going to have our profit on the right side of the sheet. If we can run our orchards and produce equally as good results with a small, medium or minimum amount of fertilizer, we are going to save some of the expense. Now I don't believe it is advisable for us to favor simply a growth of apples, or to get a great big, coarse, ill-flavored, uncolored apple, thinking that because we produce more bushels we are going to get more dollars. The people are coming to distinguish more clearly quality from quantity. Quality is that which will tell in our orchard work in the near future. If we produce a barrel of apples and put them out onto the market, and you or any one gets one of our apples, and that apple is a choice, well colored and good flavored apple, you are going to call for more of that kind. That is what the Experiment Station is trying to demonstrate to the people,—that we must produce quality. Unfortunately nine-tenths of the trees that are set on Highmoor Farm are Ben Davis, but even with that poor quality of apples we can demonstrate to you that you can improve them. The Governor of South Carolina said that almost everything had been improved, even the Irish potato had been improved and educated. Now I believe that we can in a measure improve the Ben Davis apple. It is rather a hard proposition, but I believe it can be done. Instead of bringing

out a great coarse-grained one, produce the best type that we can, one that is well colored, and then it will sell fairly well at a fair price.

Along the line of work that we are doing, besides demonstrating the effect of fertilizing and cultivating, we are endeavoring to produce other varieties of apples and determine the adaptability of those apples to our Maine conditions. We have a small nursery that is below the orchard. There are about three thousand trees. The original stock was French crab seedlings, set a year ago this last spring. This year in July and August we budded those over, to the apples which appealed to us as being desirable to grow in this section of the State. Of course it takes a long time, it is a slow process, this picking out, selecting, sorting and grading up to get a new variety of an apple that will take the place of the Baldwin as a commercial apple and at the same time bring out the color, and one that will stand up and ship across the water or to any other section of the country,—and stand up as well as the Baldwin and will have as fine a flavor as the McIntosh.

The pruning is another thing. We have done what we could to demonstrate the different methods of pruning. We have allowed some of the trees to grow as they naturally would. The Ben Davis is naturally inclined to a close-growing top. We have taken this out to allow the sun to come in and ripen up and color the fruit. It has had a wonderful effect. We have found where we have opened the top up that we have got larger apples and very much better colored apples; and the fungous diseases which attacked those which were closer growing, where the sun did not have a chance to come in and assist in killing out the spores, have troubled us less. We have had fewer scabby apples and less trouble from the fungous diseases. This demonstrates the advisability, in our section especially, of opening up the top, not trying to have them too dense or to allow them to run into the air too high, but to keep them down low and open them up so as to allow the sun and air to come in. Those are some of the things accomplished this year at Highmoor.

Now after the crop was grown the problem that confronted us was that of packing and taking care of it. When there were

only three hundred barrels it was a very easy thing to take those apples and bring them to the barn and pick them over, but when it had multiplied itself by ten and we were going to have three thousand barrels instead of three hundred it was a different thing. We had to go to work then and put up a packing shed large enough to accommodate us. The Director, by permission and consent of the Board of Trustees or Council as it is called, went ahead and built a packing shed 40x80 feet. We made a mistake in not putting it up 100 feet, because it would have been considerably more economical to handle the apples with the larger sorting space. We shouldn't have had to handle the barrels over so often. We needed that shed very much indeed and in the short time that we had this year to handle the crop it facilitated it very greatly and allowed us to handle it a great deal more economically.

It may be interesting to all to know what effect our spraying has had in controlling the insects and fungous diseases which have attacked the orchards—not simply our orchard there at Highmoor but all over the State. We found that we had got to get rid of the insects which were bothering us. In order to control them we have tried different methods of spraying, different spraying materials, different strengths, different methods of applying them. The commercial orchards were practically all sprayed with the lime sulphur of the commercial strength, that tested out 33, or 32 to 33, degrees. The dormant spray was given 1 to 10, the spray just before the buds were opening, when they showed the pink, 1 to 20, the summer spray after the leaves were all open, 1 to 40. Where we gave those three sprays we practically controlled all of the scab and other fungous diseases. In the experimental plots in the No. 2 orchard there were different strengths, and different materials used. For instance, the lime-sulphur alone without any other insecticide put in. Then there was arsenate of lead, just simply the insecticide and no fungicide, applied, and all of those different applications, which Dr. Morse told us about this morning, in different strengths. I will say right here that with lime-sulphur, the combination of the lime-sulphur with the three pounds of arsenate of lead at the commercial strength, gave us the best result of any. Those apples were free from worms. In all of

our packing this year we have only found two codling moths in Highmoor orchard—from three thousand barrels only two codling moths have been found this year. That is a record, I think, we certainly all ought to feel proud of. We had but very little russeting under those methods. On the plot where we used the Bordeaux mixture, the 3-3-50 formula, with the three pounds of arsenate of lead added, there was a good deal of russeting. It may be interesting to you to know that the foliage of the Ben Davis is more susceptible to spray injury than any other apple we have. The fruit is also susceptible of russeting. They show it quite a good deal, and the spray did not control the fungous diseases, the sooty blotch and the apple scab, enough better than the lime-sulphur so that I would feel justified in recommending that to any one else.

I might say though, that we have done some cross pollenating and hybridizing of the apples. For instance, we have seedlings which we started, the Tallman Sweet for the male parent and the Spy for the female. We have got about twenty or thirty of the different crosses, the Baldwin and Tallman, the Spy and Tallman, the McIntosh with the Grevenstein. We have got, of those small seedlings that are anywhere from six to ten or eleven inches high, 1007 which are going to be tested out the next year. Where there are three or more of the same seedlings we are going to fruit one on its own root, the next one we are going to fruit on one that has been worked to a Tallman Sweet and the third one on a French Crab, to see whether the stalk has any influence over the scion, and whether we will gain anything by rebudding and re-working; whether on its own root it would produce apples sooner than it would if we budded it on to one of the other varieties; and to see whether by cross-working it a second time on to the Tallman Sweet it would be improved in quality.

Those are the experiments that we have tried out this year, and we have succeeded in controlling the scab where we have fought it out as we know we should, we have done away with practically all the insect pests except the green aphid, and that is a continual warfare. As the Bible says about the poor,—we always have them with us. The only way you can kill them is

by spraying early and often with something that will strike against them, and with force enough so it will be driven right on to the insect. They don't eat, but do their mischief by sucking. Aside from them, we have controlled the diseases of the trees and our insect pests there on the farm.



## PRACTICAL FRUIT GROWING.

By W. H. CONANT.

It is a well known fact that a large per cent of the fruit produced in Maine is grown by farmers who carry on a system of diversified farming, and, in many cases, the orchard is a second or third consideration.

But I am glad to say a great many are waking up to the possibilities in orcharding, and today fruit growing is a live question in many Maine counties. Yet there is a lack of system in orchard management, and the question is often asked, "What shall I do for my orchard?" and so I wish to speak just a few moments on the management of bearing orchards from the standpoint of a grower. There are various systems of orchard culture, all of which are good under favorable conditions, but I believe that tillage with cover crops is best adapted to our conditions and our short seasons in Maine.

There is a balance between fruit and wood growth and this can be maintained much easier under the tillage system. The question is asked, "How and what shall I feed my orchard?" In the first place we should realize that tillage in a measure is fertilization, that working the soil liberates plant food that otherwise would not become available.

There are three principal elements of plant food with which we must supply our trees if we wish to derive best results. They are nitrogen, phosphorus and potash.

On account of varying soil conditions there can be no set formula for feeding the orchard, yet many Maine orchardists have used the following formula with excellent results; three to four per cent nitrogen, seven to eight phosphoric acid, and ten per cent potash, used at the rate of five hundred pounds per acre.

Tree feeding should be done as early in the spring as the conditions of the soil will permit, whether farm dressing is used

or commercial fertilizer. Supplying available plant food at this season tends to force a wood growth in June. I make a practice of plowing my orchard early in the spring and sowing the fertilizer broadcast. This is harrowed in well and I continue to harrow at least once a week until July 1st, when I believe cultivation should cease except in extremely dry seasons when cultivation should be continued through July to conserve moisture by aid of a dust mulch.

In many orchards after cultivation has stopped wild grasses and weeds come up which form a substitute for a cover crop; if not, a light cover crop should be sown. This tends to check wood growth so the new growth may ripen up early to prevent winter-killing.

The orchard should be well pruned, and the early spring seems to be the most favorable time for the average grower to do this work. The ever-increasing orchard pests make spraying a necessity, and this should be carefully and thoroughly done.

I have a one-acre orchard containing fifty-eight mature trees that under this system of culture has yielded in the last three years as follows:

1910 .....	125 bbls.
1911 .....	250 "
1912 .....	160 "

---

making a total of ..... 535 "

which I consider a good yield for a shy-bearing variety like the Northern Spy.

In closing, I want to add just a word of caution: *Do not try to force the orchard too hard with nitrogen.* Learn to control this element of plant food and feed as near a balanced feed as possible, otherwise you will get quantity at the expense of quality.

I earnestly believe the Maine orchardist who adopts this, or some similar system of orchard management, will in a comparatively short time be harvesting annual yields of fruit, the quality of which would be second to none in the world.

## IN MEMORIAM.

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HON. Z. A. GILBERT.

1833—1912.

Without detracting in the least from the valuable service rendered by the loyal workers in fruit culture, from the earliest period to the year just closed, it is but just to claim that Maine is indebted to Mr. Z. A. Gilbert for its progress in fruit problems more than to any other man.

Instinctively a farmer, naturally a close thinker and reasoner, conservative in methods and habits, and yet with an earnest spirit for investigation, he combined those rare qualities which, from the first, made him a safe leader, a wise counsellor, a progressive worker, a successful farmer and a reliable neighbor, friend and co-worker. A close intimacy extending over many years has strengthened first impressions of his powers of leadership. Granted a long life of service for his beloved State and its fundamental industry, his faith never wavered and there was little patience with those who doubted the certain outcome of the years. To think as he worked was ever his motto, and thus wherever he spoke, ripe, well digested thoughts, clearly expressed, carried conviction.

His term of public office for the advancement of the agriculture of the State covered that period when service was rendered for the good of the cause and with little thought of compensation, but throughout the years that service was as cheerfully and unstintingly rendered as though the salary had been liberal. Thousands of young men found the way to a happy, prosperous farm life through contact with this loyal friend of the rural home.

As one of the founders of the Maine State Pomological Society, as its president at different times for a long period, he aided in laying the foundation deep and strong for what today is an organization of power and influence. We who labor under more favorable conditions must not lose sight of the long years of thought and effort necessary to give this society a secure position with the State and insure that aid without which it could not exist. Carrying into his study of pomology the same spirit of investigation manifest elsewhere, backed as it was with a high conception of the possible value of the fruit industry, he labored incessantly for a wise discrimination in selection of location and varieties, and for that care necessary to insure fruit of highest quality. Perhaps his most enduring work on fruit problems has been to strengthen desire for the few varieties best suited to the State of Maine. In knowledge of these he was an authority recognized throughout New England. How much of the later growth and prosperity of this society, and the industry, is due to his wise counsels, earnest words and faithful work cannot be estimated, but those whose good fortune it has been to labor with him in his field willingly bear testimony to his leadership. His was the type of sturdy American manhood which saves, equalizes and promotes the better conception of rural life. He was a loyal son of Maine. He believed in the agricultural possibilities of the State. He loved rural life. He delighted in good crops, well bred and selected stock, and an abundant harvest of fruit. He had little use for the light and trivial but every movement looking to the betterment of the town, the school, the church, the home, found in him a warm advocate, a loyal defender, a persistent worker. His wise counsels in our grange gatherings, institutes and fruit sessions have been treasured by thousands who have caught from him a new vision of life, and been lifted to a higher level of attainments. His devotion was manifest in attendance upon the Field Day at Highmoor only a few days before his death. On that occasion he said to the writer, "I am not good for anything but I could not stay away. I wanted to see what is being done for better fruit and shake hands with old friends." Maine waits the coming of the man to take up the work with his spirit, carry it forward with his determination, and protect

every rural interest with the same devotion to the farm home as characterized his every act.

For more than forty years he was the recognized agricultural leader of Maine, always true to the best interests of the everyday, practical worker in field, barn, orchard, dairy and home.

The sincerest tribute we can offer will be the evident purpose of doing our work with the same devotion, intelligence and loyalty that dominated his life.

G. M. TWITCHELL.





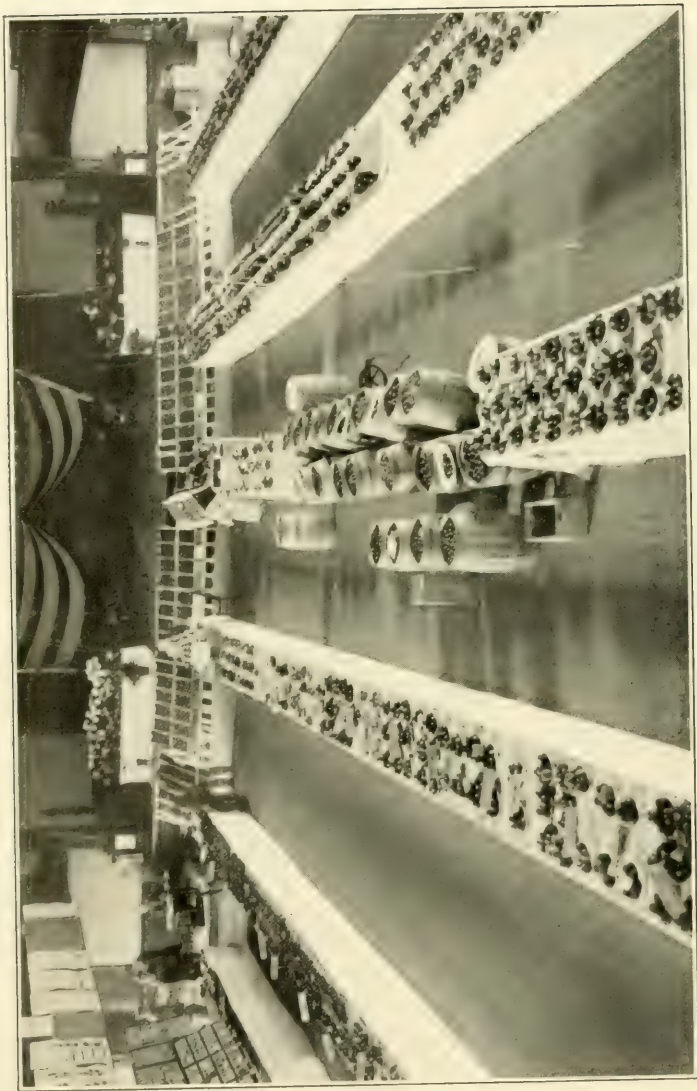
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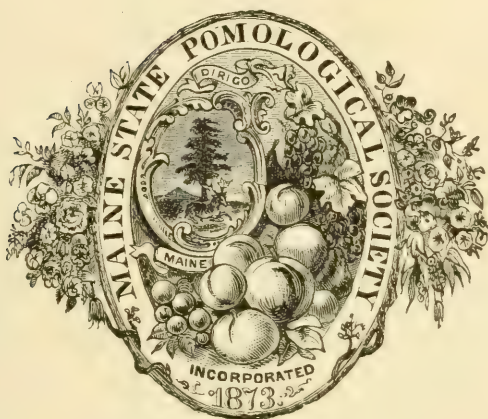




A general view of a part of the exhibits at Annual Meeting, State Pomological Society,  
Lewiston, Nov. 18-20, 1913.



TRANSACTIONS  
OF THE  
Maine State Pomological Society  
FOR THE YEAR 1913



ANNUAL EXHIBITION HELD IN LEWISTON  
NOVEMBER 18, 19 and 20, 1913



WATERVILLE  
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Lang, Ivan E.	Augusta	White, Edward L.	Bowdoinham
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Leavitt, L. C.	Kezar Falls	Wright, Frederick.	Bath
Leland, Will E.	East Sangerville	Yeaton, Samuel F.	West Farmington
Lincoln, E. L.	Wayne		



## ANNUAL MEMBERS FOR 1913.

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Conant, A. H. . . . .	Auburn	Pease, Charles M. . . . .	Anson
Conant, H. L. . . . .	Hebron	Perley, C. A. . . . .	Winthrop
Conforth, W. H. . . . .	Auburn	Philbrook, E. E., 233 Spring St.	Portland
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Fowles, A. W. . . . .	Auburn	Robbins, W. K. . . . .	Camden
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Gibbs, B. W. . . . .	Bridgton	Schrimpt, William E. . . . .	Farmington
Goodspeed, Mrs. F. J. . . . .	Wilton	Smith, M. J. . . . .	Hebron Station
Guptill, E. E. . . . .	Cornish	Spaulding, S. J. . . . .	Buckfield
Guptill, Mrs. W. T. . . . .	Topsham	Soule, A. M. G. . . . .	Wiscasset
Haines, William T. . . . .	Waterville	Stetson, C. S. . . . .	Greene
Hardy, Walter M. . . . .	Brewer	Sturtevant, Ernest F. . . . .	Auburn
Harris, A. N. . . . .	Portland	Sweetser, F. R. . . . .	Cumberland Center
Harrison, J. G. & Sons. . . . .	Berlin, Md.	Sweetser, Herman P. . . . .	Cumberland Center
Hinds, William T. . . . .	Winthrop	Tainter, Albert W. . . . .	Dixfield
Hobart, Oscar B. . . . .	Auburn	Thompson, C. R. . . . .	Jay
Hopp, W. L. . . . .	Dryden	Thorne, Sadie A., Route 4. . .	Auburn
Ingraham, William M. . . . .	Portland	Walker, S. W. . . . .	East Dixfield
Irish, Dr. I. C. . . . .	Bowdoinham	Warren, F. W. . . . .	Buckfield
Irish, James E. . . . .	Buckfield	Warren, M. A., Route 1. . . .	Buckfield
Johnson, E. E., Route 1. . . . .	Hebron	Washburn, C. C. . . . .	Mechanic Falls
Jones, Austin . . . . .	Bangor	Whiting, F. E. . . . .	Hebron
Jones, George T. . . . .	Fairfield Center	Whittier, A. L. . . . .	Chesterville
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Lee, Lyman K. . . . .	Foxcroft	Woodward, J. H., Route 6. . .	Auburn
Lewis, Dr. C. E. . . . .	Orono	Woodworth, W. H. . . . .	Berwick, N. S.
Littlefield, Eben E. . . . .	Belfast	Wyman, F. L. . . . .	West Paris
Littlefield, J. R. . . . .	Brooks	Yeaton, G. A. . . . .	Norway





A portion of the exhibit of jellies, preserves and canned goods at Annual Meeting, Maine State Pomological Society, Lewiston, Nov. 18-20, 1913.

ANNUAL MEETING  
OF  
MAINE STATE POMOLOGICAL SOCIETY,

LEWISTON, NOVEMBER 18, 19 AND 20, 1913.

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TUESDAY EVENING, NOVEMBER 18.

ADDRESS OF WELCOME.

HON. W. B. SKELTON, President Lewiston Chamber of Commerce.

I rejoice in the opportunity in behalf of the business and professional interests of Lewiston to participate with you in the opening exercises of your annual exhibition. A word of appreciation of the work of your organization is pleasant and appropriate. A word of explanation of the work and purposes of our organization will, I trust, not be out of place. And a suggestion or two concerning our reciprocal obligations cannot be entirely without profit.

Your society has been in existence for a period of forty years. The Act of incorporation was signed by Gov. Perham, February 17, 1873. I am not familiar with its more remote past. I presume it must have traveled the up-hill road common to all pioneers in a work of general uplift. The fact that it has maintained its organization during all this time and is today a state-wide institution drawing patronage and exhibits from all parts of the Commonwealth speaks well for the purposes of the society and the persistence of its officers and members.

When we read the announcements for the meetings and see the exhibits shown we are impressed with your present strength. You have drawn together a list of speakers that amply testifies to your standing at home and abroad. You are offering 272

cash prizes aggregating \$1,141, and three silver cups. This is doing business on a breadth that would be a credit to a society much more general in its purposes.

This exhibition is, I am aware, only an incident in the campaign the State Pomological Society has conducted during the past few years. And to its efforts very largely is due an active work throughout the state which, from the very nature of things, cannot bring large immediate results, but will gradually and surely put Maine where she ought to be among the producers of good fruit. The old practice of planting an orchard and waiting complacently to harvest the crop is being discarded. It is no less humiliating than unprofitable for our people to be furnishing a market for Oregon apples, when we can beat them at their own game if only we will. To you who are successfully struggling for this end we say, Welcome, and God speed.

Of our own work, that of the Lewiston Chamber of Commerce, which I have the honor to represent, I may say that our purposes are much like yours. Our slogan is, "Lewiston, the Industrial Heart of Maine," and if you will look at the map you will agree that it is not inappropriate. You will find us nestling at the foot of one of the best powers of a river that has as good natural facilities for furnishing power as almost any in the country, and whose natural facilities have been augmented largely through the engineering genius of a member of our Chamber of Commerce until we no longer fear spells of low water. We are the center of a steam railroad system that taps directly our county and Franklin to the north clear to the Rangeleys, our own county and Oxford to Rumford and the lakes again, our own county, Kennebec and thence on to the northern and eastern parts of the state and the provinces, our own county and through Cumberland, Sagadahoc and Lincoln to the coast, by the Grand Trunk to central Oxford and beyond to Canada, and by the Maine Central to Portland and beyond. We are the center of a great trolley system linking us with the suburbs and extending to Waterville in one direction, and through Brunswick to Bath and Portland in the other, with a direct line to Portland nearly completed. Geographically we are the center of a circle with a radius of fifty miles whose sweep would include eight cities and nearly half the population and more than half the wealth of Maine.



As the business organization of such a city, so located and so blessed by nature, we realize that our mission is a state-wide one. Ambitious to increase Lewiston's industries and beauties, we neither expect nor hope to accomplish it in any selfish manner. The time is past when any man or body of men can prosper alone. We have unsurpassed schools, unsurpassed natural power privileges, unsurpassed systems of communication with the world, and an unsurpassed citizenship. But we must have a market for our products, as you must have for yours. The nearer and the more easily accessible that market is for us and for you the better for each of us. In a word, we hope to increase Lewiston's prosperity by doing our part with you and all other citizens toward making it a center of a more prosperous community, a more prosperous state. We want to become better acquainted; we want to make our relations more intimate; we want to share in your prosperity; we want you to share in ours. The hope that we may in some degree accomplish this is the controlling reason for seeking these conventions. Do not understand me to mean that we are not glad of your presence as a social event, because we most certainly are. What I do mean is that in the great economic struggle in which we all are engaged, your fight is ours and ours is yours, and each may best help the other and thus himself as he best appreciates that fact.

These are days of great undertakings,—big business, as we often hear it termed—and we can best succeed by keeping that condition in mind. We may and should keep our minds open and our thoughts active to correct the errors that attend it, as we would punish them elsewhere. But it is useless, even if it were desirable, to crush it because it is great. It cannot be done without substantial waste and hardship, waste of present facilities for production and hardship to those involved.

Some one may say he has no tears to shed for a multi-millionaire whose property would depreciate. Stop a minute. Do not think the millionaires are the only ones involved in big business. When you think of the American Sugar Company, consider that it has 18,000 stockholders. The Pennsylvania Railroad has 84,000, and the American Tel. & Tel. Company has more than 53,000. Fifty-three per cent of the stockholders

of the Sugar Trust are women; 49% of the Penn. R. R. and 52 1-2% of the Telephone Co. They are not all large stockholders, but their holdings are large for many of them individually. They reach every village and hamlet in the land. They are your customers and neighbors, and ours. One-half of the funds of the savings banks of this state are invested in corporation stocks and bonds. And those funds represent the accumulations of more than 233,000 depositors, 312 out of every thousand men, women and children in the state. Where is greater proof that every man owes his neighbor a duty, and must coöperate with him.

The lesson is plain. Our work must be constructive, not destructive. The corporation is but an aggregation of individuals. The merchant and the mechanic and the farmer are all parts in the great mass, and what truly benefits the individual benefits the mass. We have no right to oppose legislative reforms conceived by the Grange, nor you those put forward for the manufacturer, the merchant and the laborer. In our several walks and interests we perceive separate and distinct needs, but so long as they severally look to the improvement of the general condition of humanity they will be generally beneficial, and we must give and take as we work toward that end.

Again I say, we gladly welcome you here. We welcome you because you represent the best citizenship of the state. We welcome you because your increased prosperity prospers us. We welcome you because our mutual contact and better acquaintance makes for broader views, broader mindedness and that spirit of coöperation without which there can be no real social, educational, political and financial growth and stability. We earnestly hope that when your labors are ended and you repair to your several homes, you may each and all carry with you a warm spot in your hearts for our city and our citizens.

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#### RESPONSE.

DR. G. M. TWITCHELL, Auburn.

As a private in the ranks, it is a pleasure to me to stand here at the request of our president, and accept the cordial words

of welcome, so feelingly uttered. I thank him in behalf of the society, and thank you as citizens of Lewiston for these earnest words, and the many evidences we have of a meaning which is deeper sometimes than words, of a desire to coöperate with us.

Almost fifty years this society has been holding these annual gatherings through the towns and villages and cities of the state of Maine, with the hope that thereby we might increase the interest, and strengthen the desire for the growing of better fruit. These are your sessions, as well as ours, and I wish that every member of the chamber of commerce, and every citizen of the city of Lewiston, might feel tonight, as he goes out of the hall, that he is an ambassador, sent out by this society to spread the word that this hall is open for the next two days to the citizens of Auburn and Lewiston and the adjoining towns, and to the whole state of Maine, and that we shall not be satisfied unless the people come here in numbers to examine the fruit, to listen to the addresses, to talk over the subjects which interest us all, and then to go home with a better appreciation of what we are doing. The sessions are for the state of Maine, and not alone for the State Pomological Society.

Sometimes, according to the local press, somebody has evidently suffered because he has bought a peck of apples, and has not got what he expected, for I read occasionally a complaint about the quality of apples grown in the state of Maine. But I want to say that the citizens of Lewiston can buy as good apples as the citizens of London or Edinburgh if they want to. The price of apples in the state of Maine this year is from three dollars to three and a half, per barrel, for choice, No. 1 fruit, and there is not a man in Lewiston but could have all he wanted. But if you prefer to go into your stores and pay thirty-five cents a peck for cider apples, do it. But do not blame the Pomological Society, and do not blame the growers. Every fruit grower in Maine is doing, or trying to do, just what every good business man is trying to do,—find the best market for his fruit. And he is not at fault for doing it.

I have been looking through some of the stores the past few days, and I have been surprised at the price which was asked, and the quality of the fruit which I found there. And dealers told me that it was the best that was offered. And yet, as I know, and as you know, in Auburn, and Turner, and Lewiston, and Greene, and Wales, and all the adjoining towns, just as

good fruit is raised as can be grown anywhere upon the face of the earth. And the farmers grow it to sell, and they sell it where they can get the best market.

Now, Mr. President, we ask you and your chamber of commerce and the citizens of Lewiston to join with us and help translate your words into deeds, that we may make the work of this society more effective in years to come. The representatives from Lewiston and the senators from Androscoggin county stood valiantly and loyally with us in our efforts to secure the law which was passed last year, which aims only at one thing, and that is that every man who buys a barrel of apples shall know, when he looks at the brand, that the contents of the apples inside the barrel correspond from top to bottom with the brand upon the outside. We stand for a clean pack, a true grade, and an honest brand; and that is all the law aims to accomplish. And we ask of you your coöperation that we may make this law more effective in the future than it has been in the past. And when we get that law enforced throughout the state, and demand of those who handle our fruit that the apples shall be packed in that manner, every man can buy just what he wants, and be certain that he is getting just what he buys.

But with that, there is another thing in which it seems to me we need some assistance and some coöperation. We want to make more lively and earnest this discussion as to the need of better fruit. There is a great study before us, in order that we may solve the problems. Those of us who have been working along year after year are conscious today as we never have been before, that we know very little about the subject. Its magnitude is growing upon us. We need the help and assistance and coöperation of everyone who is interested, that we may solve those problems and be able to combat the diseases and pests and difficulties which are to be found all along the line. And doing this, instead of raising a million and a half barrels, the normal crop of the state of Maine, we will be raising five or ten millions, and every town and every city will be enriched, as will the hillsides and valleys of the good old state of Maine.

Gentlemen of the chamber of commerce! we ask you to unite with us from this time forward, as you have in the past, but even more earnestly and devotedly, in helping to translate our words into tangible results for the good of all.



## ADDRESS.

DR. ROBERT J. ALEY, Orono.

*Ladies and Gentlemen:* I am very glad indeed to have this opportunity of meeting with the society and with the citizens of this city. I am especially glad of the opportunity of seeing the splendid exhibit and the fine products of this state. I believe we need to learn two great lessons if we are to be the great people that we have seen ourselves in our dreams. I believe it is true of every individual, everywhere, that if he is to realize what it was intended that he should realize, he must be, in the first place, the best individual that it is possible for him to be. He must be able, as an individual, to seize upon opportunity, and to use all things that come to hand in the best way possible. But he must be more than that. He must be able to see in the work of another, simply another side of his own work. He must be able to join with his fellows in the best sort of team work.

One of the hardest things that confronts the captain of a foot ball team is driving the lesson into each member of the eleven that he must be the best individual player that he can be, but he must also be the best team player that it is possible for him to be. The player who can only play a star game to the grand stand does not last long. On the other hand, the one who can do nothing except in unison with others, has a life equally short. The team, when it is finally in shape to win victories, is a team that has in it eleven men, each of whom is capable of a great play; but it is also a team of eleven men who can become, as occasion demands, one man. And that is the lesson, it seems to me, that confronts us in life. If we are to make the state of Maine as great as we ever dreamed she should be, we will make her that only when every citizen of the state realizes that he must be the best individual citizen that it is possible for any man to be, and at the same time realizes that he must coöperate with his fellows, and must sink, when necessity requires it, his own personal individual traits into the common good. To put it another way, it is necessary, it seems to me, today as it has never been before, that we all realize



that progress is a sort of unity,—that no individual can progress very far by and of himself, that no organization with some particular work to do can do that work successfully for a long period of time, unless that society takes into consideration the work of other societies, probably far remote from it in purpose and interest.

The man who would be a great man must be greater than the thing he does. The doctor who sees absolutely nothing but the narrow line of his medical profession, who does not see that all other professions and all other businesses must grow or decline with his, is not the doctor who contributes much to the life of the community, or to the general advancement of his fellows. The business man who lives for his business alone, who fails to see that the business of his competitor, the business of his friend, in some other line of activity, is important, who looks upon all other things as sort of enemies of his, is the business man who sooner or later, generally sooner, goes into the hands of a receiver, or into bankruptcy. No one can get very far in this world if he bases his life upon a selfish interest. Recent years in the business world have given us some splendid examples of the fact that business that grows and waxes strong is business that takes into consideration the general welfare, not only of those immediately connected with it, but of all of those who in any way are remotely served by it. The old method of railroading of a generation ago, a method that looked upon practically everything as an enemy, a method that proposed to extract the largest amount in pay, and render the smallest amount in service, is a method that has been found fatal to development and progress of the business itself.

Out in the far northwest J. J. Hill, the great railroad builder, brought into activity the new and modern idea, which is accepted by practically all great business enterprises today. His guiding principle was that the business of the great corporation that he was developing would grow great only if he could make every other interest of the community through which his lines went, great also. He gave to this country perhaps one of the first and one of the best illustrations of this matter that I am talking about, the unity of progress. He realized that if his money was to bring him returns, returns must come to others. And so he interested himself in the improvement of the cattle

that were growing upon the great pasture lands of the region through which his railroads went; he interested farmers in improving their methods, and increasing their yield; he did everything needed to bring prosperity to others, realizing that in that prosperity his interests would have a proper share.

It seems to me that if this principle that the progress of any of us is intimately bound up in the progress of all of us can get into the thinking and the acting of our people, many of the problems that have troubled us in the past will become remarkably easy of solution in the future. We see many evidences that this is coming to be true. It is not an uncommon thing today to find business men uniting to give credit and strength to a rival who may be hard pushed by some business trouble. I can well remember the time, as many of you can, when if a business man was in trouble, all his rivals helped him over the divide, and gave him a push down the other side. But we are seeing better than that today, and we are realizing that the failure of this enterprise or that or the other, in some way comes back and reacts and reflects upon the enterprise in which we are engaged. We need to see that this principle applies in all parts and activities of our lives. Sometimes the relation is very remote. Sometimes we grow impatient with the man who is working upon this line or that or the other, that to us seems unimportant. We fail sometimes to realize that the scholar working in his laboratory, upon some problem that seems to us remote from any activity upon which we are engaged, is not merely a dead expense to the community.

I suppose over in Germany a generation or more ago there were a great many people who looked upon Hertz, the great German scientist, as a man who was being supported in idleness and worthlessness when he was devoting his days and his weeks and his months and his years to the study of waves. There are people, no doubt, who looked upon him as almost out of his head when they saw him out there by the side of the lake, studying the action of waves, under different influences, seeing how these waves interfered with each other, and how under certain conditions they destroyed each other, while under other conditions they tended to increase and multiply each other. Then when he extended his study to the action of

heat producing waves in the air, and finally to sound waves, and then to waves produced by electricity, there were perhaps none who realized that he was doing anything of value. But one day a Marconi took up the work that Hertz had done, carried from the point to which he had brought it, and gave to the world wireless telegraphy, the greatest invention that we have had in many ages. We need to see in a larger field that all the work that men of intelligence and honesty are engaged in, will either now or ultimately contribute to the progress of us all.

We have been slow, in America, to realize that our progress is tied up, in the knowledge that becomes common to us all. We have not paid, in America, very high tribute, as a rule, to men who know. We have been slow to believe that the man who is devoting his life to the finding of new knowledge, to the pushing out of the boundary of knowledge, is a man of any interest to us. But we are beginning to realize that. You have in this hall tonight a splendid exhibition of fruit, largely because men in Maine and elsewhere for years have devoted themselves with great zeal to the discovery of truth, because they have hunted down disease to its very foundation, and found the methods and means of combatting it,—because they have traced this pest and that to its lair, and understood its life history, and found out how to control or exterminate it.

What is true in fruit growing, is true in a thousand industries today. We are only beginning, however, to rest, as we ought to rest, upon this foundation of knowledge. If, somehow or other, we could as a people increase our faith in knowledge, it would mean much for our progress. That means a unity. It means that all of us must unite in believing that there is such a thing as truth, that there are men who by devoting their lives to the search of truth may find some of it, and in being willing to follow their control.

Perhaps the two greatest words linked up with the progress of the future are the words "honesty" and "coöperation." It was suggested here by one of the speakers a moment ago that this society whose meetings we are attending stands for a barrel of apples or a box of apples that is uniform throughout. Most of us can remember, not very far back either, when in the business world there was not much honesty, when you could

not trust a merchant as to the quality of the cloth in the coat you bought, when you could not trust him as to the quality of the sugar, or the coffee, or the rice, or the flour, when you could not trust a trader as to the quality of anything that he offered for sale; when the whole business world, the world of exchange and barter, was filled with distress. Today that has been largely replaced, because there has gone into the hearts of all of us in this matter of business a principle of common honesty. We believe in our fellow man, and in turn we expect him to believe in us. And that mutual faith has been aroused because there has gone into the practice of us all a larger modicum of honesty.

I well remember the story of John Wanamaker, when he opened his store in Philadelphia and announced through the papers of that city that in his store all articles would be marked in plain figures, one price to everybody, and that any buyer dissatisfied could return his purchase and receive his money back without any question being asked. Without a single exception, every merchant in the city of Philadelphia prophesied that John Wanamaker would be bankrupt inside of three months; that no business could be conducted on that basis; that unless you had different prices upon the same article to different people, that unless you insisted that when a sale was made it was made, and must stick, you could not live in business in the good old Quaker city of Philadelphia. But John Wanamaker based his practice upon faith in people. He proposed to deal in absolute openness and honesty with those who dealt with him, and he is still in business.

Thousands of men—hundreds of thousands of men—have followed that example. And so I want to say again, that one of the greatest words in life today is that word "honesty." It is the great key-word of our progress and success for tomorrow. But along with it goes that other word that has been mentioned I think by all the speakers, so far, this evening, "coöperation," coöperation in the broadest sense, coöperation with the man who is in a business entirely different from ours, giving to him the same courtesy, having in his operations the same faith, believing that there is in him the same honesty that we expect him to believe there is in us,— coöperation in such a broad sense that it reaches out and touches all the activities of all men.



There are many things that perhaps at first sight do not seem to have any relation whatever to our own prosperity. And yet, as I have already indicated many times, these things finally come around to be the greatest things in our own development.

May I illustrate by a story connected with the development of the telephone? Some thirty or forty years ago there came into the city of New York, on an emigrant ship, a boy from Servia, very poor, landing there with nothing, securing work upon one of the docks at a very low wage. He managed to live in the simplest sort of a way. Filled with a desire to know, however, he was soon enrolled in one of the night schools of New York City. His desire to know was so great, and his ambition so strong, his intellect so acute, that in a few years he was able to take an examination and enter Columbia University. He made such a brilliant record there that upon his graduation he was taken into the faculty as an instructor, received rapid promotion, and soon became a professor in that institution. His chosen branch was mathematics, that dry subject. He devoted himself particularly to the application of mathematics to various mechanical, electrical, physical problems. He learned one day that the telephone was in trouble because when it extended its line beyond a few miles it was impossible to carry on conversation. There seemed to be a muffling of the sound, an interference of some sort. This man decided there was a problem worth studying, and he began applying his mathematics to it, and his knowledge of the interference of wave motions, and he figured out that under the known laws of electricity this interference ought to occur at about a certain distance. He determined almost exactly what that interference ought to be. He contrived a means of overcoming it, tested what he had worked out as a result of his theory, and sold it to the telephone company for two million dollars, and the telephone company was at once able, by means of his diagram, to extend their lines, and we have the long distance telephone as a result of this man's work.

Here was the coöperation of a man devoting his time to a pure science, a man simply immersed in formulas and theories, with one of the most practical inventions of the age, making it really worth while, as an instrument of conversational relationship, bringing all parts of the country into what we might



term conversational relationship. I might give you many more illustrations, but I must not trespass upon your time to do it. I merely want to say again, that if our progress is to be what we want it to be, we must rest it upon these two great modern notions of absolute honesty and the most complete sort of coöperation. And we must realize, I take it, as we have never realized, that in our progress we are all bound up together, and that no one line of our development can get very much ahead of other lines. No one man can get very much ahead of his fellows. The whole of us must go together, or our progress is tied up in that way, and if a large number lag behind, presently all of us are pulled back. But if all of us are pushing forward by this spirit of honesty and coöperation, then those leaders of us who are ahead can step up a little faster, for because of our honesty and coöperation we can follow their leading with greater speed. That we may be able to do this, I am sure is the hope of all of us. And I may say further, I believe it is the abiding faith of all of us.

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## IMPROVING THE MARKETING AND DISTRIBUTING OF FARM PRODUCTS.

By HON. CHARLES J. BRAND, U. S. Department of Agriculture,  
Washington, D. C.

The time has come when we, as workers for betterment of agricultural conditions in the United States, have got to begin to instruct our farming public just as earnestly about business and business ethics and commercial practices as we do about the rotation and cultivation of crops which the farmer is to employ, how and when he shall spray, or how to feed his stock. Agriculture is a business industry, and as such is merely one part of the great business structure of the country. If farming is to continue profitable and farm life is to be made attractive, we must in the next decade or two give the same attention to the business side of farming that we have in the past two decades to the producing side.

The farmer especially needs help and information along three distinct lines:

First, education and assistance in all matters relating to the improvement of the methods of producing and handling his many crops.

Second, suitable and convenient arrangements for securing the credit that is necessary to enable him to conduct his business from one crop season to another.

Third, he needs assistance in the establishment of a marketing system which will return to him the true value of the particular qualities of the various crops that he produces, minus reasonable charges for handling, transportation and the legitimate profits of middlemen.

Numerous efficient agencies are now engaged in assisting the farmer in a multitude of useful ways on the production side of his activities. The agricultural colleges and experiment stations, the United States Department of Agriculture, many railroad systems, commercial bodies and other organizations are giving valuable assistance along this line. The devising and adoption of a credit system suited to the farming industry is now very much in the public mind and may be realized in the near future.

As one step toward the goal of a more rational system of marketing and distribution, the Department of Agriculture has established an Office of Markets for the study of the basic principles involved in this problem, for the wide dissemination of information relating to it, and for the demonstration of such methods as may seem to promise best results. Several of the states and a number of municipalities have also established commissions or set aside funds for activities toward the same end.

A great many people seem to consider the matter of getting more money for the farmer as an end in itself and not as a means to an end. To make farming more profitable without at the same time educating the farmer as to how to spend his additional gain would fail wholly of any useful purpose. This money must be devoted specifically to making the farm home a place where the young people will be glad to stay, to promoting social life in the country, to providing rural recreation, better roads, better schools, better churches and a higher type of manhood.

The work of the Office of Markets has not yet progressed sufficiently so that we can say much about what has been accomplished. Hence, though disinclined to do so, we are compelled to present plans rather than results.

In too many cases one of the greatest difficulties surrounding the farmer's marketing problems is his inability to get short-time loans on anything like reasonable credit. No matter how useful the purpose to which he intends to devote the money, the banker is loath to give him credit and the commission house exacts a high rate of interest. This was brought to my attention recently in connection with the cotton investigations of my office. We are trying to develop the grading, handling and marketing of cotton on a community basis at various points in the South. One of our most earnest community groups is located at a small town in Arkansas. To sell cotton to any advantage, an association should have at least 50 bales of each grade to offer. As there are nine full grades and many other recognized qualities, it requires considerable time before a group of growers can accumulate enough bales to offer even-running lots. Inasmuch as they are under heavy expense for picking, ginning and baling and at the close of the long season of outgo without income, they must borrow money or let the cotton go a few bales at a time as ginning proceeds.

This particular group of growers was enthusiastic enough so that they united to construct a creditable sheet-iron warehouse with their own labor devoted to the work when they could spare time and on rainy days. In the hope of securing moderately reasonable credit, one of our men accompanied the leader of the growers' association to one of the leading banks in Little Rock. The president of the bank, while expressing interest and anxiety to assist, stated that no money was available for such loans, that they now had \$3,000,000 loaned out on cotton, all of which is to local cotton buyers and commission men. The president stated that no farmers had any of this money, and further that he was one of the committee handling the Arkansas allotment of the \$5,000,000 of government funds distributed for crop-moving purposes, and that so far as he knew no farmer was able to avail himself directly of the use of any part of this fund.

Not wholly discouraged in this quest, the seekers for money went to one of the largest commission houses trying to secure a loan on 175 bales of cotton which had all been graded and which averaged strict middling. The best arrangement that could be secured promised to result in the following monthly charge against each bale of cotton, estimating the bale as worth \$70:

2 1-2% commission .....	\$1 75
Insurance .....	25
Interest at 10% .....	58
Warehousing charges .....	25

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Charges per bale per mo..... \$2 83

This represents 57 points or more than 1-2 cent per pound per month, which is more than any grower who is holding cotton from a purely non-speculative point of view could consider. It should be remembered that the purpose in holding this cotton was to get a sufficient number of bales of even-running grades for commercial transactions.

The farmer suffers not only in the securing of money loans, but also in securing the necessary store credit for carrying him through that part of the season when he has no considerable product to market. This is especially true of the cotton farmer. Part of the difficulty can be obviated by diversification so that something may be in hand for sale at any season of the year; but even so, capital or credit is required to carry on any business. Store credit comes high, both on account of the rate of interest charged on store accounts (particularly in the South) and because prices are elevated to an unreasonable extent to this class of credit purchasers. Work is necessary along many lines.

The plan of the Office of Markets at present in view includes the following:

- (1) The study and promulgation of market grades and standards.
- (2) Market surveys, methods and costs.
- (3) Investigation of transportation and storage problems.



- (4) City marketing and distribution investigations.
- (5) Studies and demonstrations in coöperative production and marketing.
- (6) Cotton handling and marketing investigations.

Standardization is of the utmost importance. Only when products have been properly graded can they be traded in to the advantage of both the seller and the buyer. This is no truer of farm products than of mill and factory products. Until standardization was introduced, the steel industry had a very varied career. Now standard patterns and grades are manufactured in practically every plant of the world which can be used interchangeably in any type of construction calling for a particular pattern. Standards are necessary in order that the purchaser of a given product may know within reasonable limits what the seller proposes to deliver at a given price. Prices cannot be made rational without them.

Second only in importance to the establishment of standards is the living up to them. On this point there is opportunity for a great deal of educational work among farmers. They must learn, as practically all large manufacturers have learned, that only the highest quality brings the highest price and that rigid adherence in spite of obstacles to the established quality is essential to business success. Too often the farmer sees some temporary or apparent advantage in delivering a product of inferior quality at a higher price. This practice must be discouraged and the farmer must learn that even though it sometimes entails loss, his business contracts, for such they are, must be lived up to.

Another type of error which the farmer is very likely to fall into is the failure to fulfill an agreement when he has contracted to furnish definite qualities and quantities of product at a definite price at times when the price has advanced. Too often the man who has purchased from him is told under such circumstances, substantially the following: "Oh, I sold that to so-and-so day before yesterday. He offered me a cent a pound more than you are paying." Business confidence and stable conditions in marketing can never be established until the farmer abides as scrupulously by his agreements as does the



higher and more successful type of business man. I do not wish to be understood as criticising the farmer over-severely along these lines. He has unfortunately frequently dealt with buyers who indulge in chicanery, so that he has come to the conclusion that this is business and that such are the methods of all business men, and he is merely attempting to protect himself against similar sharp practices.

Next to standards in importance, or perhaps even of greater importance, is the necessity for genuine coöperative organization in the handling of both producing and marketing problems. Agriculture is the only industry of any importance in the United States which does not have a considerable degree of organization. Some industries are very completely and perfectly organized; others but loosely. Agriculture, in a large sense, is unorganized. The individual producer cannot accomplish with small unit quantities what the carefully organized association, shipping and selling by car or even train lot, can accomplish. I do not wish to be understood as saying that there are not many organized producing, marketing and distributing organizations. What I do mean is that considering the extent of our agricultural industry, the organization of today is a mere beginning. It has become quite the custom to hold up to the American farmer the perfection of organization and methods that exist in Denmark, Ireland, Germany and Italy. I will venture the guess, as there is no definite information on the subject, that in the aggregate purely coöperative or semi-coöperative organizations in the United States buy and sell a product exceeding in value the total product coöperatively bought or sold in all of the countries mentioned put together. The coöperative grain elevators alone, which are not truly coöperative in large part in a technical sense, handle through their selling and buying departments crops and other materials having a value of probably no less than \$600,000,000 per annum. Add the millions of dollars' worth of dairy products handled by the coöperative creameries and cheese factories and the tens of millions of dollars' worth of products sold by the coöperative citrus and deciduous fruit associations and the truck growers' organizations, and it will be readily seen that the total value of products handled by organizations partaking in some degree of a coöperative nature

will reach possibly the enormous total of \$800,000,000. Indeed it would not surprise me in the least if the total amounted to a billion.

The scattered occurrence of coöperation in the United States is responsible for the impression that coöperative activity is not extensive. The large aggregate value of products handled disposes effectively of any idea that coöperation is rare in the United States relative to other countries. It is merely undeveloped so far as the opportunities within our own country are concerned.

The two greatest problems in the success of coöperative organizations are competent management and the keeping up of that keen interest and the securing of that active participation of members which is essential to success and without which no true gain for country life will have been secured. An organization that is successful in its handling of these two matters is practically sure to meet with general success.

Coöperation cannot be foisted upon the people by outside agencies. The desire for it must either be occasioned by difficulties in marketing or other farm activities or must be cultivated by education as to the benefits to be obtained. We must appeal in this country to the intelligence of our farmers more than to their necessities. The economies to be effected justify a certain degree of government assistance and encouragement.

It is our purpose to make a thorough-going study of existing marketing, distributing and purchasing organizations, and where conditions warrant, to aid so far as the authority of the Department permits in the establishment of new organizations. We will aim to make the office a sort of clearing house for coöperative marketing information of interest to both associations of producers and consumers. This work will be carried on in close coöperation with the Rural Organization Service, of which Dr. T. N. Carver is the Director. In coöperation with the Office of the Solicitor, a careful study of the laws of the different states under which coöperative enterprises must operate will be made. Drafts of constitutions and by-laws suitable for different farming industries which will enable them to organize and operate with efficiency will be prepared. Systems of accounting and auditing for coöperative associations will be devised and the information obtained will be made available through publication of bulletins and otherwise.

It is important that this gathering should carry home to their respective spheres of labor this definite thought:—Educational work in regard to coöperation is necessary all along the line and uniform and efficient methods and ideals must be developed. Courses of study should be outlined in the colleges and universities suitable not only for their own curricula, but for the agricultural high schools of the states and for other educational institutions offering courses of agricultural instruction. Only in this way can be developed a common body of information which will result in the extension of the application of the principles of coöperation and in the dissemination of necessary knowledge for making coöperation successful. We do not attach as much importance to the absolute adherence to the Rochdale principle of one man, one vote, as do coöperators in some of the countries abroad. In many communities the truly coöperative plan can be applied. In others, the attempt to apply it absolutely would doom to failure efforts to bring about united activities.

To another and highly important class of activities of the Office of Markets we are applying the name of Market Surveys, Methods and Costs. The purpose of this work is to determine the normal marketable quality of specific products within certain trade areas with the possibility of increasing such supplies as well as determining the immediate prospective supply at given periods or to be marketed within specified periods of time. Studies of the demand for various products at consuming centers, the mapping of areas usually drawn upon for supply, time when the areas ship, normal prices and prices in periods of scarcity or over-supply, will be carried on.

The interest in a market news service for perishable products is so great that we propose to investigate methods of bringing the information developed in market survey work promptly to the attention of producers and distributors. It does not seem at all likely that telegraphic market news service would be feasible, but it does seem likely that certain classes of information not requiring telegraphic or expensive forms of distribution can be obtained and be made available, especially to associations of growers. Communication with individual producers is almost a physical impossibility, which is another excellent reason for coöperative organization.

Further lines of work which will be included in market surveys, methods and costs are the investigation of the efficiency and limitations of various methods of wholesale disposition of farm products through brokers, commission men, public auction, etc., and a determination of the usual and necessary costs, charges and profits incident to each system. Similar studies of the subsequent retail handling and distribution of products will also be conducted.

We succeeded this fall in making a small beginning in this work by a survey, in which the Bureau of Statistics assisted, of the quantities of cabbages and onions for winter withdrawal which have gone into cellar and other storage in the North during the season just closed. It is of the utmost importance to the southwestern grower that he know in advance of planting whether the quantities stored in the North are sufficiently great to injure or demoralize the market for which the southwestern grower plants. In 1912, ignorant of these facts, cabbages were over-planted to such an extent as to ruin the market for both the fresh and the stored product. With cellars and storehouses full, the fall plantings were so heavy that the prices were depressed to as low as \$3.50 to \$4.00 per ton in shipping sections where right now prices from \$18.00 to \$20.00 per ton are being paid. The information obtained, even though of a fairly indefinite character, was wholly sufficient to indicate that generous plantings in the Southwest could be in order. Work of this kind will have to be handled carefully and conservatism will have to rule. I cite this merely as one of the many specific things to be done.

At the present time the South Atlantic and Gulf States derive practically no commercial advantage from the early maturity of their corn crop. A complication of excellent reasons no doubt exists for this condition, nevertheless a method of handling and marketing should be devised to bring this crop upon the market promptly at a season when prices are usually high and when corn is generally difficult to obtain. It seems a shame to have ripe corn hanging on the stalks in the South when the western crop is not yet ready for market, only to be offered later when generous supplies, due to the western harvest, are naturally depressing prices.

It is our intention that the work of the Office of Markets



shall be definitely practical and helpful to the country. While the Department is chiefly interested in assisting the farmer producer, nevertheless it has a very direct, intimate interest and desire to assist the consumer. In order to be in a position to help in some measure in the solution of the problems involved in provisioning metropolitan populations of various sizes, investigations of city marketing and distribution have been undertaken. This work contemplates a study of the uses and limitations of farmers', municipal, wholesale and retail market houses, curb markets, huckstering, and other systems of city distribution, and an investigation of the feasibility of direct dealing between producers and consumers not only through open market houses but by means of parcel post and express shipments, family hampers, and other methods.

In this connection also, we propose to encourage the development of local production of perishables in connection with rural and urban marketing systems. Why should Chicago be getting her cauliflower from Long Island or California at a time when the local producing area could well furnish it? Why should peaches be hauled from Arkansas to Philadelphia at a time when West Virginia can well supply that market? How is it that truck growers in the Mesilla Valley cannot sell their produce in El Paso because of the low price at which the shipped-in California product can be bought by the commission men? What can we do legitimately to bring about conditions under which the grower near to El Paso can market his product at home without being ruined by the low-priced diverted shipments which are put into that market to avoid sending them to over-supplied markets farther east? This matter of developing home production or production near the large cities is one of great importance.

In connection with the study of the utility of parcel post I may say that we have made good progress in determining suitable containers for butter, eggs and certain vegetables. A recent shipment of twenty-five dozen eggs in one and two-dozen lots resulted in a breakage of only five eggs. Here the container is the important thing, and it also seems likely that it may be necessary to ask the Post Office Department to amend its rules in order to make this excellent means of communication of greater practical utility.



In this connection it may not be out of place to say just one word about that threadbare subject, the cost of living. The consumer himself is the only person who can do anything immediately in this matter. Let him stop telephoning each morning for market supplies and instead, in cities that are supplied with market houses, visit the market and select his produce there. Let him take the trouble to get acquainted with near by or even slightly distant farmers within the first two parcel-post zones, within which express rates also for large quantities are reasonable. Let the housewife standardize her needs to some extent and overcome the false pride or laziness which prevents carrying home even so small a purchase as a spool of thread. Let the retail merchants give a discount to patrons who pay cash and more particularly to those who carry home their purchases, and savings will be effected immediately. I do not mean that this provides a final solution of the problem. It merely presents some of the ways in which to make a beginning.

Individual retailers insist, and there is no reason to doubt their truthfulness, that they are not making excessive profits. The trouble is that there are so many retailers and the methods of distribution and delivery that have developed are so expensive that the overhead charges which the product must bear add excessively to the price. A two or three per cent reduction for cash with a further substantial reduction for self-delivery should result in decided economies all around to the consumer.

Transportation, both on account of its cost and on account of the deterioration which farm products frequently suffer in transit, is one of the most important of the general problems relating to marketing. In a broad sense it is unlikely that freight rates on farm products are unreasonably high, though there are probably particular commodities which pay a higher rate in proportion to the care they require than others, and there are no doubt points or even areas which suffer unduly through freight-rate differences. However, the chief problems related to transportation have to do with other points than rates. I will merely run over some of those which require investigation with a view to possible improvements. I am of the opinion that most of our railroad systems will coöperate in bringing about changes for the better wherever the facts

leave no doubt as to the desirability of the changes. Their willingness to assist the farmer in his production and other activities indicates this. We need a more comprehensive organization of transportation companies for the continuous carriage of products from points of origin in producing centers to terminal markets and points of consumption, including probably more general privileges of diversion or reconsignment from terminal markets to other points. Refrigerator-car construction deserves careful investigation, as there is very general complaint from shippers and receivers as to the bad condition which frequently prevails when cars are received.

The demonstrated economies and reduction in deterioration and waste due to precooling at production points leave no doubt but that we should urge a far more general introduction of precooling practices. Present demurrage regulations are such that even in times of distress and car famine refrigerated, heated, or ventilated cars are retained for purely storage purposes on side tracks at terminal points when they should be rolling back for new loadings. This practice is necessary in part at present, due to insufficient terminal storage facilities.

In connection with transportation studies there will also be made a study of storage problems, beginning with refrigeration and cellar storage in the home, intended to promote family buying in larger quantities and extending through the practicability of local cold storage at shipping points and in smaller markets, as well as at the large terminals. Investigations tending to a just and equitable distribution of refrigerator and other cars in times of need are also desirable, as well as a study of the efficiency and utility of iced pick-up car and other special services.

The opportunities for developing trolley freight service from near by producing sections have not been utilized to the extent that they deserve. Work in this direction is also projected.

Careless car and train handling are responsible for large aggregate injury to perishable products. A particular case has come to my attention in which 800 baskets of grapes in a single car received in the Cincinnati market were so badly smashed as to require repacking. The railroads are at the mercy of their employees in this matter and are deserving of assistance in educating their employees and interesting them in the economies of more careful handling.



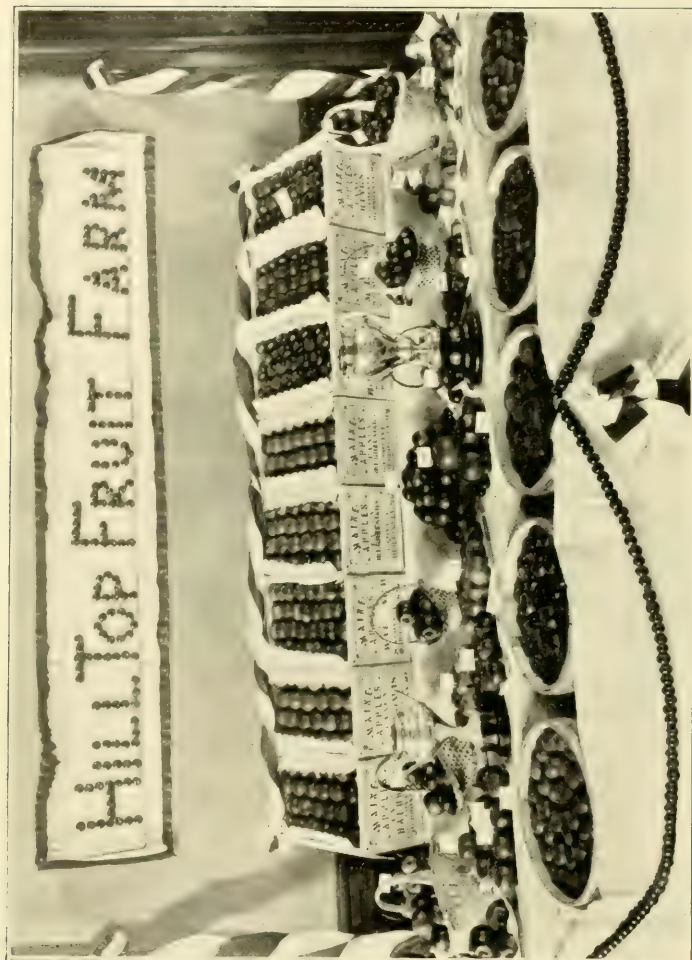


Exhibit of W. G. Conant of Hebron, at Annual Meeting, State Pomological Society,  
Lewiston, Nov. 18-20, 1913.

We are not using our water transportation facilities to the extent they deserve, and at specific places it may be possible to encourage such use by the presentation of rational plans.

I will not detain you further with the enumeration of the many specific problems that require study. The Department realizes fully that it will be difficult to change practices which have grown up through a long series of years. Nevertheless, we are confident that a determination of points at which wastes can be eliminated and the suggestion of methods for accomplishing this result will bring about many savings.

In developing the work of the Office of Markets, I desire to emphasize especially my wish that so far as possible this work be done in coöperation with the colleges, stations and departments of agriculture of the states. If you have problems in the solution of which we can help you, let us know and we will give our best efforts to assist.

I hope that it will be possible for the Office of Markets to develop a service which will be as definitely useful to the farmers of the country with reference to marketing as that furnished by other branches of the Department has come to be in the province of production.

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WEDNESDAY, NOVEMBER 19.

PRESIDENT'S ADDRESS.

MR. HOWARD L. KEYSER, Greene.

*Ladies and Gentlemen:* I am glad to welcome you here this morning to the annual meeting of this society, and also to congratulate our members on the encouraging outlook for our future.

After the season of 1912, and the greatest of all nightmares of orchardists, over-production, we open the season of 1913 with the greatest shortage of winter apples the world has known for years. Surely nature is fickle, and in the usual course of events the season of 1914 will most likely find our old friend, over-production, with us again. And I want to say here, there is no such thing as over-production until every man,



woman and child in America and abroad, that we can reach, have had all the apples they need or can eat. But there is such a thing as under-consumption; and we suffer from both.

One of the best ways to correct over-production is to advertise the apple and increase consumption. And the plan proposed by the International Apple Shippers' Association to sell stamps to be placed on barrels and boxes, the proceeds to be used in an active advertising campaign, is a good sound business proposition, and should meet with the assistance of the growers of our state. The only good adverse criticism I have heard of the so-called stamp act is that, as usual, it all comes out of the producer. But we have grown accustomed to that. Proper distribution, fortunately for us all, has at last been recognized by the government, and the agricultural department now realizes that while the man who can show us how to grow a good red apple where poor ones grew before is a public benefactor, he also will be a benefactor who can solve the problem as to how the grower can secure sixty cents instead of thirty-five cents of the consumer's dollar.

We are partly to blame for the present condition ourselves, in not coöperating for our mutual protection. The success of so many who have tried it, proves it a part solution of the trouble. An old farmer said to me a short time ago, "This talk of coöperation may be all right, but oxen and horses don't work well together." I agree with him; but in such cases why not have a separate association for each?

The city press would have its readers believe that part of the high cost of living can be laid at the door of the cold storage warehouses, which are, in reality, an equalizer of prices, and a necessity to the fruit business. In fact, I consider cold storage such a necessity that I again urge upon our members some action, at this meeting, looking to the future establishment of some local storehouses through the fruit belt. I am firmly convinced that concentrated action along this line will bring results.

Our insect pests and fungus troubles seem to multiply, and your officers this year have tried, in the program to be presented to you, to cover the important ones, and have been fortunate in securing the best authorities in the country to instruct us in the best and latest methods to combat them. I

desire to mention, in particular, the grave danger that is with us in the last and greatest invasion of the brown-tail moth we have ever had, and that we urge upon our commissioner of agriculture the great necessity of a vigorous enforcement of the law regarding the removal of the winter nests.

A very large per cent of the fruit raised in our state is exported to Europe by way of Liverpool, and I desire to call the attention of the members again to the steady increase in freight rates to that port. In the last five years that increase has amounted to thirty per cent, and to some other foreign ports the increase has been greater. It is fair to presume from the past, that the industry will be burdened to the limit, unless such societies as ours take some concentrated action to protect themselves.

Let us also urge upon our fellow fruit growers in Massachusetts the importance of some action on their part, urging legislation similar to the New York State Commission Bill, providing for the licensing and governing of the business of the commission men. This law enacted by the last legislature of New York cannot help being of great benefit to producer and consumer, and it is legislation to which surely no honest commission man can take exception.

I want to congratulate the society upon the greater recognition it received from the state during the meeting of our last legislature, giving it an opportunity to widen its scope and increase its field of activities. Also, that after a struggle of four years to correct the evils of our lack of uniform pack, the legislature passed a law giving every grower a right to ship any quality of apple grown, but making it a misdemeanor unless stenciled true to name; a hardship on no grower, only a demand that if he use the word "Maine," he must be honest. This law will be enforced by our present commissioner in an able, honest and efficient manner, and cannot help being of great benefit to the fruit industry. It is to be hoped that our members will be more than careful of their personal pack, and report any known violation of the law to the inspector, promptly. In years of plenty, Maine apples will be in demand if our stencil is known to be true.

"In union there is strength." We want every man and woman who is interested in orcharding in Maine as a member

of our society. We need them and they need us. If they are not interested in "Better fruit for Maine," we will make them so. Let us all pull as one strong team together.

I have referred to the necessity of cold storage, the investigation of freights, and the increase of members, and I recommend the appointment of standing committees of three members each, to be known as storage committee, transportation committee, and membership committee.

At the close of two years administration of the office to which you have twice honored me, I want to thank the members and the officers for the loyal support I have received at all times, and bespeak the same for my successor, and pledge him my hearty coöperation in his work, which, while at times he will find it exacting, will also have its pleasant side, in the knowledge that he is doing his utmost to place a great industry on a sure foundation for succeeding generations.

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## FACTORS INFLUENCING SUCCESSFUL ORCHARD SPRAYING.

DONALD REDDICK, Professor of Plant Pathology, Cornell University.

In attempting to speak on such a subject, I realize fully that local conditions and special adaptation for work will require that I confine myself strictly to general fundamental considerations. The differences in conditions in the state of Maine and in New York are sufficiently great to make reference to specific cases and to different years impracticable. One of the most noticeable examples of this occurs in the present year in the case of potato blight. We have not seen a blighted potato in the state of New York, but I find that your growers have had a great deal of this disease, particularly the tuber rot stage. Neither am I sufficiently familiar with the general location and size of your commercial apple orchards to be of particular service to you in making specific recommendations. There are, however, certain fundamental factors which will hold true in the spraying of any apple orchard and it is to these factors that I would direct your attention.

## THE APPLE SCAB FUNGUS.

In order to freshen our memories a little, allow me to recite briefly the life cycle of the apple scab fungus. The scab disease is selected because it is the most important disease of fungous origin that northern and eastern apple growers have to fight. The habits of fungi in general are not so commonly understood as those of insects, owing to the facts that most of the important structures of fungi are microscopic in size and that their devastating work has been done even before they are apparent to the naked eye.

*Winter Stage.* The fungus causing the scab of apples, as you will recall, passes the winter in the infected, fallen leaves on the ground. In New York state we have never been able to discover any other stage by which the fungus gets through the winter. Within the past few weeks, however, Doctor Morse, of your Experiment Station, has recorded some very interesting observations in which it seems quite certain that the fungus has been able to hibernate on infected twigs of the previous year. How generally such conditions may prevail remains yet to be seen, but apparently this discovery will not materially affect the method of scab control, inasmuch as experimental work in most of the eastern states has shown that a proper application of fungicides as generally recommended is effective.

*Spore Discharge and Dissemination.* The fact that the scab fungus certainly passes the winter on the fallen leaves leads at once to the question of how the organism is able to get from the ground to the developing foliage and fruit of the tree. The way in which this is accomplished is exceedingly interesting, but to be appreciated fully, should be observed under the microscope. An examination of old leaves in the early spring often reveals the presence of minute globose bodies developed within the tissue of the leaf. These bodies are exceedingly small and for the most part are barely large enough to be detected with the naked eye. With the occurrence of the spring rains, these bodies increase slightly in size and break through the epidermis of the leaf on the side which happens to be lying upward. Doctor Wallace, who was formerly a student with us, has followed the development of this



body, technically known as a perithecium, and he finds that there is a definite correlation between the development of these bodies and the pushing forth of buds on the apple tree in the spring. At about the time the blossom buds are unfolding, at least by the time of opening of the blossoms, it is found that the perithecium has become fully matured. Upon examining into the structure of one of these bodies with the microscope, it is found that it is essentially composed of a thick, black protective covering, on the interior of which there are numerous tubular sacs, each of which contains eight oblong, brown spores or reproductive bodies. If the perithecium is carefully pricked out of the leaf tissue and placed in a drop of water for examination with the microscope, it will be observed, if the spores are matured, that the tubular sacs absorbing the water become very much lengthened and protrude from the apex of the perithecium through a minute opening which does not appear until the perithecium makes its last increase in size. The spores enclosed in the sacs are crowded to the apex and spore after spore is violently ejected, all eight spores being discharged within a minute or two. When all of the eight spores have been ejected the empty sac collapses and its place is taken by another and thus the process repeated. As a single perithecium may contain two hundred such sacs, one can readily calculate how many spores might be cast from a single one of these bodies. Leaves are often found on which the perithecia are exceedingly abundant and in one case, in an examination by us, it was found that if there were a continuous layer of leaves under a tree spreading 40 feet, bearing perithecia in the abundance of the fragment under examination, there might be ejected during a period of 45 minutes of rainy weather not less than eight billion spores.

While it has just been stated that these spores are ejected with violence, the height into the air to which they are ejected is not more than one-fourth of an inch. The exceedingly small size of these spores, however, permits them to float about in the air more readily than particles of dust, and the impulse afforded by the mechanical ejection from the sac is sufficient to place them in air currents which may carry them to apple foliage. It is obvious that the greater majority of spores lodge in un-



favorable places and die, since their lodgment on apple foliage is left entirely to chance. However, as all of you know, a sufficient number of spores do lodge on apples to make it exceedingly unpleasant for us in certain years.

*Conditions Necessary for Infection.* If one were to drive through an orchard with a sprinkling cart about blossoming time and wet the dead leaves on the ground, it would be perfectly possible to bring about the ejection of spores just described. It does not follow, however, that scab spots would develop on the foliage and fruit. It is absolutely necessary for the germination of these spores and penetration of the cuticle of leaf and fruit, that moisture be supplied in sufficient quantity and for a sufficient length of time to permit the spores to germinate. During periods of high temperature, germination may occur in five or six hours, but during colder weather, 18 or 20 hours may be required. It will be seen, therefore, that conditions favoring the ejection of spores are also essential for spore germination. The ideal condition for abundant germination and infection would be a rain of sufficient extent to moisten thoroughly the leaves on the ground, to eject the spores from the perithecia, and this rain followed immediately by calm, foggy weather. Every opportunity would be afforded for spore germination and abundant infection might be predicted.

Once the germ tube of the spore has punctured the cuticle, there is no way possible of preventing further growth by the application of spray substances that might be used safely on apple foliage. It should be borne in mind that the spore is exceedingly small and that the germ tube issuing therefrom is also very small. From day to day food substance is absorbed from beneath the cuticle and a gradual development occurs. In the course of a week or ten days the development has reached such a point that one can see small olive green spots on leaf and fruit.

*Secondary Infection.* Almost as soon as these spots are visible to the naked eye, microscopic examination will show that a new kind of spore is being developed. These do not differ materially from the spores already described, but their position and abundant production makes rapid and wide dissemination very easy.

Perithecia which are not in condition to allow ejection of spores during a given rainy period are apt to ripen during the following warm days and be ready at the next period of rain for spore ejection. Thus it may happen and frequently does that new infections at favorable periods are continually recurring, both from the leaves on the ground and from earlier infected leaves on the tree.

So it goes throughout the season. Rainy weather followed by periods of calm, foggy weather, permit new infections to occur. When we have a dry summer, as not infrequently happens, many spores are produced which perish for the want of moisture, but with the occurrence of fall rains, sufficient spores are found to be in a viable condition to cause further infection, as many of you know only too well.

#### PHILOSOPHY OF DISEASE CONTROL.

*Spray Before the Rain, Not After.* From what I have said you will see that it is coming to be understood generally, by men who have fungous diseases to fight, that any fungicide to be at all effective must be one that will adhere to the foliage during periods of prolonged rainy weather and, above all, that fungicides must be applied to the parts attacked before the conditions arrive which make spore germination possible. It is believed that more failures to control apple scab and many other fungous diseases are attributable to the failure to recognize this one point than to any other cause. It is, therefore, worthy of repetition, that any fungicide, to be at all effective, must be one that will adhere to the foliage during periods of prolonged rainy weather, and that, above all, fungicides must be applied to the parts attacked before the conditions arrive which make spore germination possible.

*Weather Forecasts.* I presume many of you are already wishing to ask the secret of predicting rain periods and, in order not to arouse your hopes, I wish to say at once we have no way of telling certainly whether rain will occur or not. We have, however, a very effective way of determining whether atmospheric conditions are such as to permit rain to fall if there is moisture in the clouds. This service is free to every person in the United States. I refer to the weather reports

issued daily by the United States Weather Service of the Department of Agriculture. The weather map, made up and issued at 11 o'clock A. M., also at 8 o'clock in many places, is a satisfactory way of predicting the general conditions. A little study of these maps from day to day will soon place one in position to tell when storm periods are likely to occur. It is commonly known that storm areas travel from west to east. In general, the rate of daily travel is about 500 miles, but there are, of course, many variations from this. One can readily locate storm areas on the map from the fact that such areas are always indicated by a low barometer and by the fact that the word "Low" is printed on the map.

*When to Spray.* Having become acquainted with the progress of a storm area by a little daily study, one can then determine with some degree of certainty what day the storm center is likely to be over the state of Maine. With these facts in mind and watching the development of foliage and buds very carefully and knowing the approximate number of days necessary to cover a given area of orchard with spray, one can figure ahead when each spraying must be commenced in order to finish ahead of the storm. If there is some one in the community who can use a compound microscope, he can follow the development of spores on the fallen leaves and in this way the number of days can be narrowed down even more.

That one not especially trained can predict storm periods with some degree of certainty is attested by the fact that the speaker some years ago, in doing vineyard spraying in the state of New York, was successful in predicting storm periods at the five critical times for grape spraying and in every case the applications were made before infection occurred. In one case rain began falling in less than an hour after the spraying was finished, while in another case rain did not occur for about 24 hours. These grapes were carried through the entire summer absolutely free from rot, whereas grapes on adjacent unsprayed rows were so badly rotted as to be unmarketable.

That one cannot always be so successful in predicting rains may be shown by the fact that the speaker, only last spring, in connection with some orchard spraying, made an application

of spray which it eventually developed was entirely unnecessary. It ought to be explained, however, that the conditions existed which would have permitted rainfall within 24 hours after the spraying was done, but it so happened that the clouds bore no rain.

#### APPLE SCAB CONTROL.

*Hindrances.* It may seem like a relatively simple matter to follow these things through and come out successfully, but I can assure you it is not. Storms are often erratic, coming with much more speed than ordinarily. Fruit buds may develop slowly and following an unexpected warm day may come out more rapidly. The period involved in the first two summer sprays is a most critical one, and those of us with experimental work on our hands spend some very unpleasant hours trying to guess whether the buds will have developed far enough to be sprayed satisfactorily before a given storm period arrives, or whether the scab fungus has produced spores in a quantity sufficient to insure infection. I can assure you that we search the daily paper for the weather map before we look for baseball news or the latest developments in the Mexican situation.

There is still another difficulty involved. The expense of spraying is such that it is always necessary to bear in mind that protection of foliage from fungi must be coupled in some way or other with an application of an insecticide to kill insects. I have this in mind in connection with the first application for apple scab, holding off the application until the bud clusters are expanded sufficiently to drive the spray down on the pedicels and at the same time getting the poison on early enough to kill the bud moth in its early stages. Then again, there is the necessity of combining the first codling moth spray with the application of spray to the young fruit to prevent scab. A few warm days may cause a rapid development of the young fruit and the calyxes may close before it was anticipated. In following these conditions in a number of places in western New York during 1911 and 1912 it was found, except on early blooming varieties for which no record was kept, that there were only four days time when either of the applications



could be made effectively in these two years. The actual number of days when spraying might have been done, so far as the development of the buds was concerned, might have been extended but for the occurrence of rain in one case, and in another the intervention of a Sunday with rain on the following Monday. In the present year the majority of orchards in Western New York did not receive the application before the blossoms opened because it was predicted that an application would not be necessary until a certain Monday. The result was that three successive warm days forced the buds at a tremendous rate and by Monday many of the trees were in full bloom. A very few men began spraying on Friday and Saturday. However, subsequent developments showed that this application of spray was not effective so far as scab was concerned, inasmuch as no infection weather occurred for a period of nearly three weeks thereafter.

It appears, therefore, from what has just preceded, that there are three variables involved in making a successful application of a fungicide to control scab. These may be enumerated as follows: First, temperature and its resultant effect on bud development; second, rainfall and attendant atmospheric conditions; third, occurrence and development of the scab fungus. It will be seen at once that the inter-relation of these variables leaves the fruit grower with very little option in the matter. It, therefore, behooves him to be prepared to take advantage of every slight opportunity. With these considerations in mind some of the accessories that have proved time savers may now be mentioned.

#### EQUIPMENT FOR SPRAYING.

It is not uncommon to find orchardists who require more time to fill their spray tank than to empty it. It must be borne in mind that filling spraying tanks is not spraying. With us it is an exception rather than the rule to find a grower who is able to spray out more than ten 100-gallon tanks per day, even barring all engine and nozzle troubles. In order to do a thorough job of spraying at any time, it requires from six to ten gallons of spray to cover a tree 40 years old. I think you can



readily calculate that under these conditions one cannot expect to spray more than 600 to 800 full grown trees with one outfit and hope to control apple scab in an epidemic year.

*Equipment needed.* Most of you will doubtless raise the objection that it would be very expensive to keep two spraying outfits for an orchard of 1,200 to 1,500 trees, to say nothing of the difficulty involved in supplying teams and men at such a busy time of year. My only answer to the objection is that it *must* be done that way if you are to secure the best results. The only alternative is to put out daily more gallons of spray per outfit or to find a more rapid way of applying the fungicide. Some of the items that we have found of importance in permitting a larger output I wish to discuss a little more fully.

*Equipment for Rapid Filling.* My personal experience the past summer in helping perform extensive experiments has brought forcibly to my attention the great importance of being in readiness for making an application. One of our experiments was located on the farm of a progressive orchardist in Wayne county. The other experiment was located out of the apple section and on a farm where the apple was a secondary crop—in other words, an ideal place for our purpose so far as disease was concerned. In the first case every provision was made to keep the men and outfits working at full capacity. If there was the slightest tendency for the ground to be heavy, three horses were put on the 200-gallon gasoline sprayer. When the spray tank was empty the horses were run from the field to the central filling point. At the central filling point every provision was made for very rapid work. As a matter of convenience powdered arsenate of lead was used. This had been weighed out in paper bags several days previous. The lime-sulphur solution was allowed to run out in a large tub and could be dipped up without any delay whatever. A gasoline engine located at a nearby spring kept a very large supply tank full of water. This tank was elevated on a platform and opened into a second tank of 200 gallons capacity. As soon as the empty sprayer reached the filling station one man made it his business to attend to the lime-sulphur solution and the other to stirring up the arsenate of lead. The outlet from the 200-gallon tank to the sprayer was five or six inches in diameter. The young men who attended to these operations were sons of the owner and a part of the firm. The result was that

they worked at top speed, and on several occasions I have seen them load their sprayer and get away in seven minutes' time. The speaker was ostensibly helping the applications in the experimental plats, but in this orchard it worked out practically that his time was taken up largely in keeping time records and things of that sort. Indeed, as the dusting outfit was working at the same time he had all he could attend to. In this orchard the experimental applications of spray to 100 20-years-old trees were finished each time in less than four hours.

At the other orchard it was entirely different. The owner was very willing to do all he could but he lacked the experience that the other man had, and he did not have full appreciation of the great importance of the time element. It, therefore, worked out practically that the writer and his associate had to help toggle up the engine, help bail water from the spring to fill the spray tank and handle the spraying poles in addition to making the records. Working under these conditions, the best record we ever succeeded in making was 30 minutes for filling and the same amount of time for emptying.

*Equipment for Rapid Emptying.* The ways of the gasoline engine are beyond the comprehension of a great many men. Not only is time lost in toggling up parts that are out of order, but not infrequently it happens that some part is broken and must be ordered from the factory. The time when spraying is to be done is entirely too precious to be taken up with engine troubles, and it is, therefore, desirable that the engine be thoroughly overhauled some time in advance of the spraying season. Parts that are apt to wear out or break under strain ought to be kept on hand in duplicate. Extra pieces of hose to replace ones that develop breaks may also save several hours of precious time. The discs in nozzles wear out very easily, especially in applying the dormant spray and these discs ought to be purchased by the dozen. Splicings for a bursted hose may likewise prove great time savers. Packing for pumps and couplings for spray hose should have a place in every tool kit.

#### SPRAYING AGAINST THE WIND.

Another important feature in reducing the time element is to make a practice of spraying each tree as you go—in other

words, to adopt the practice of spraying against the wind. Unless some of you have heard Professor Whetzel talk on this subject already, I am sure you will at once say that this is entirely out of the question. I wish to assure you that it is not out of the question at all and that while many of our growers insisted at first that it could not be done, still we find many of them are practising it regularly now. We also found that there were men who followed the practice for a long time before we agitated it at the New York State Fruit Growers' meetings in 1911. The idea in spraying against the wind is to hold the nozzle at such a point as to cover one side directly and allow the wind to carry the mist back and cover the opposite side of the twig or branch. The team is headed into the wind. The spray poles are thus held out laterally and one is able to comb the tree with spray and still wet neither the operator nor horses. The only condition necessary is that the man on the ground be provided with a hose of sufficient length so that he can work on the next tree back from the one the man on the tower is spraying.

#### LIMB SPRAYING VERSUS TREE SPRAYING.

You will notice that I said comb the tree. I have in mind here that each particular branch must receive special attention. It is not enough to spray a tree at a time. Each branch must be treated as a unit and the nozzle passed up and down each individual branch. This, of course, requires time and a considerable quantity of material. I have considered that if it is worth while to make a spraying at all it is worth while to do a thorough job. It is for this reason that I stated a moment ago that from six to ten gallons of spray would be required for a 40-years-old tree, and that to cover 150 trees was a big day's job for one outfit working at maximum capacity.

It is scarcely necessary to more than mention two conveniences that should be a part of every outfit. I refer to the tower and the poles. The two most important summer applications of spray cannot be applied at all effectively to trees of any size unless one of the operators is sufficiently elevated so that he can drive the spray down into the blossom clusters and later into the calyx cup. I have used the word pole advisably.

The spraying rod is a menace to good work, meaning, of course, the heavy iron rod that is used too frequently in spraying. The pole should be just as lightly constructed as possible. Any one who has held an iron rod all day realizes that towards the end of the day, the rod is held, not operated, and that pointing a rod in the general direction of a tree is not spraying according to the general definition of the term.

#### PROVISION FOR SUFFICIENT HELP AT SPRAYING TIME.

I am not sufficiently acquainted with Maine conditions to more than touch on another feature that is becoming an important consideration in the state of New York. This is the question of whether or not individuals are not planting too extensively. The point involved has nothing to do with over-production, but rather the question of maintaining a proper balance between the orchard and the other farm operations, so that the orchardist may be assured of having men and teams in sufficient number to do orchard work at the effective moment. If this is not done the orchardist must put up with transients at spraying time or he may even find it impossible to get his spraying done at all.

*High Pressure Spraying.*—As was intimated a few moments ago, there is another way out of this difficulty—the possibility of applying the fungicide in some other form or with some kind of apparatus whereby a great deal more territory can be covered. The possibility of spraying with extreme high pressure has received some consideration in Massachusetts and in the far west but has not been adopted generally as yet, probably because of the high cost initial.

#### DUSTING.

All of you have noticed that when lime-sulphur is applied to the foliage, changes set in immediately and in the course of half an hour the sprayed leaf takes on a whitish appearance. This, as most of you know, is due to the liberation of a certain amount of sulphur. The individual particles of sulphur thus set free are exceedingly small and are held more or less firmly



to the leaf by the calcium sulphide or other inert ingredient and by the arsenate of lead. As soon as these facts became evident, trials were made of the fungicidal value of finely ground sulphur in preventing the spores of the apple scab fungus from germinating. As was to have been expected, finely ground sulphur proved equally as effective as lime-sulphur solution. It seemed, therefore, that the only question needing consideration was to determine whether sulphur applied directly to foliage and fruit of the apple could be depended upon to adhere for a sufficient period of time to prove of value. If this proved to be the case there seemed to be no reason why the fungicide might not be applied in the dry state. It is well known that a much larger area can be covered with a dusting outfit and that orchards in which the soil is too wet to be sprayed with the ordinary liquid sprayer might be covered satisfactorily with such an apparatus. Work was started in the summer of 1911 to determine whether the dusting method would prove effective or not. A dusting machine was obtained and dust mixtures of various sorts carrying various amounts of insect poison in addition to sulphur were applied. It was realized from the outset that the satisfactory control of insect pests by means of a dry poison was equally as important as the control of apple scab with a dry fungicide, inasmuch as the two operations must be combined if for no other reason than the item of cost. Owing to the very unusual season no results were obtained in 1911. In 1912 the work was continued, but not on a very extensive scale, owing to the fact that orchards could not be found in which a reasonable amount of scab might be expected to develop. With the rather late fall rains of 1912, however, scab spread abundantly on the foliage and accordingly extensive experiments were planned for 1913.

#### DUSTING COMPARED WITH SPRAYING.

Two orchards were selected for the work and in each case 100 trees or more were included in the experiment. I exhibit here a chart showing the results obtained in a Greening orchard at North Rose, N. Y.



*Picked Greening apples, Catchpole orchard, North Rose, N. Y.*

PLAT.	Count trees.	Total apples.	Perfect.	Imperfect.	Scabby.	Bud moth.	Codling moth.	Curculio.
			%	%	%	%	%	%
Check.....	4	6363	8	92	80	39	12	4
Lime sulphur.....	4	8864	61	39	21	23	1	.48
Dust.....	4	11000	64	36	33	4	.4	.14

The blocks of apples were so selected that trees were nearly uniform in size, of the same age and equally exposed to the possibility of scab infection. The materials used were as follows: Commercial lime-sulphur was diluted at the rate of 1-40 and to this was added powdered arsenate of lead at the rate of two pounds to 100 gallons of liquid and applied at the rate of two and one-half gallons per tree. The dusting mixture was composed of finely ground sulphur mixed with powdered arsenate of lead to make a 20% lead mixture. This was applied at the rate of one and a half to two pounds per tree. All of the work was done on the same day and no external factors entered to influence the results one way or another. In many spraying experiments check plats do not receive sufficient consideration, and I, therefore, wish to call attention to the fact that as a check against the work we left a block of 32 trees untreated throughout the season. Coming now to the table, you will notice first that in the case of insects we secured better results with the dust mixture than when the poison was applied in the liquid form. It should be borne in mind, however, that codling moth, which is ordinarily our chief insect enemy, was not particularly abundant even in the unsprayed block. The control of bud moth and other spring caterpillars listed here under bud moth was exceedingly good. It might be stated parenthetically that equally as satisfactory results were obtained in 1912 when a mixture containing only 10% of arsenate of lead was used.

We come now to the figures in the table of most interest to me as a Plant Pathologist. You will notice that the dust

mixture has not given as satisfactory control of scab as was obtained with lime-sulphur solution. The percentage of control, however, is very gratifying, considering the fact that all of the other dusting experiments thus far reported from Experiment Stations, with the possible exception of some work done in New Jersey, have been entirely against the use of dust. It seems quite possible that we may be able to refine our method another year to such an extent that we may secure as satisfactory results with the dry application as with the lime-sulphur solution. It appeals to me that the biggest obstacle, namely, the control of insect pests, has been overcome. I am not in a position to recommend to any one that he abandon the liquid spray. After we have accumulated data from another year of experimentation I shall feel in a position to offer more definite information on this subject. I believe, however, that a man with a young orchard coming into bearing, who is seriously contemplating the purchase of an additional spraying outfit, might well wait another year with the idea that dusting may be so far perfected that it will prove profitable for him to purchase a dusting outfit instead of a spraying machine.

Ques. How long would a lime-sulphur spray for scab be effective?

Ans. For a long time. Bordeaux mixture will be there during the season, that is, on an area which is not increased in size.

Time is precious in spraying an orchard and the machinery should be kept in proper condition. Filling the spray tank and fixing the gasoline engine, mending poles and cleaning out nozzles are not spraying, and these are not things that ought to be done during the spraying period. That time is precious and the apparatus ought to be put in shape so no time will be lost.

Ques. What is your standard pressure?

Ans. We get lots of standards out in the orchards. They run up to 200 pounds, and the big nozzles that we like best and are in common use don't work satisfactorily at a pressure under 150 pounds. Some people like to get out a row of nozzles. We never have been satisfied that we could do the best work with more than two nozzles on a pole.

Ques. Do you use the largest size disk?

Ans. Yes, providing we have the pressure.

Ques. Is 150 pounds a satisfactory pressure?

Ans. It is, for the large Friend nozzle that we commonly use; 150 pounds is necessary to produce the fog that is needed. Two hundred pounds will work all right, but anything under 150 does not give the fine spray that is really desirable.

Ques. With good sized trees, how many would you cover with 100 gallons?

Ans. We find that trees 40 years old, large trees, that haven't been trimmed and trimmed, require six or eight or even ten gallons per tree. It takes a lot of the spray to cover them satisfactorily.

Ques. How long does it take to put out 200 gallons?

Ans. It took us 30 minutes—seven minutes to fill and 30 minutes to empty.

Ques. What kind of sulphur do you use in the dusting process?

Ans. A brimstone ground exceedingly fine, so 90% of the sulphur would pass through the 200 mesh to the inch. In other words, it is finer than can be bought ordinarily. It is a preparation that can be manufactured if there is a demand for it.

Ques. If the spores winter on the limbs, would the spraying with lime-sulphur prevent those spores from developing?

Ans. I rather question it. We didn't seem to get that effect.

Ques. We understand that Bordeaux stays on better than lime-sulphur?

Ans. Yes. The only reason I wouldn't spray with Bordeaux is, about three times out of five we get so much Bordeaux injury the apple looks worse than as though it had the scab on it.

Ques. You get lime-sulphur injury?

Ans. Very little. Lime-sulphur injury with us is largely a question of burning through the leaf where the skin has been lifted up and the spray gets down in.

Ques. Do you think climatic conditions have anything to do with injury by spray?

Ans. They do unquestionably with Bordeaux mixture, but with lime-sulphur I do not know. We get some rather conflicting results there. The lime-sulphur we certainly can use on apples. It is decidedly preferable to Bordeaux mixture.

## ADDRESS.

By HON. JOHN A. ROBERTS.

This association, in its forty years of work, has had a great influence upon the business of orcharding, in the state of Maine, and its influence is increasing from year to year. I wish, in a very brief time, to take a survey of orchard interests in this state, as I view them at the present time, and then I want to speak a minute upon organization work, to see if some of the problems that confront us cannot be worked out more economically, and at a more rapid rate.

The orchards of this state, of which there are many thousands, as a rule are small. We have many hundred orchards that number 50, 100, 150 or 200 trees. We have very few large orchards, and we find, as I view it, this condition of affairs: While there are many growers of fruit who give excellent care to their trees,—cultivating, pruning, fertilizing, looking after insect pests and diseases, and doing everything possible, we find on the other hand a large percentage of men who are neglecting their trees. Those men are a drag upon the business, and if there is any influence that can be brought to bear upon them to do better work, that is what we are after.

Again, when we come to the handling of the fruit, everything seems to be disorganized. Some sell their fruit to speculators, some to commission men. One ships fruit here and another there. There is no system in the matter of marketing our fruits. And again, there is no system in the matter of packing and branding our apples. There is no common agreement among the men who pack apples, the shippers and the buyers, as to what a No. 1 apple is. Even under the law which was passed last winter, we find that one man will contend that a certain barrel of apples is a No. 1 class, while another one, who has been in business perhaps an equally long time, will contend that it is not. There is no standard. Everything seems disorganized. I do not know as I should use the term "disorganized" because there never has been any organization. So the situation of the fruit industry in this state is that we have very little system. But if we are to succeed and make Maine really a good orchard state, raising good



apples, packing them properly, and putting them upon the market where and when we can get the best price, it seems to me there must be organized effort.

We hear a great deal about the Oxford Bears' organization. You all know about them and about their success. There is no question but this organization has been a success, and a great success. Now what I believe we want in this state is more of such organizations. We want every community organized. And when we have these local organizations, we want a central organization. And with that central organization, if properly conducted, I believe a great work will have been done, or at least that we shall be in a position then to accomplish a great work. This central organization will work out many things. It need not be an organization of much capital, but if the local organizations were agreed upon a central organization to handle the crop, and the sole business of the central organization was to handle the crop and market it in the markets of the world, compelling the fruit as it comes to them to be graded and branded according to their desire, and as the markets demand, it seems to me that we would then be in a position to market our apples and put them upon the market according to the demand, and not, as now, produce a glut at one time and a scarcity at another.

Now out of that might grow, it seems to me, some beneficial results, and I am going to name them,—not necessarily in a logical order. First, if our apples were in the hands of a few men to sell, we could develop our home markets. And that is one thing in this state about which we are negligent. We have a population in our cities of several hundred thousand people who like apples, who like good apples, and who would buy Maine apples if they could get them. The fact of the case is, wherever you go into a city in this state, or a large village, even today, when apples are plenty in the period of harvesting, we find apples from the states of Washington and Oregon in large quantities displayed in the windows, and taking the place of the fruit that we ought to be putting in the windows of the stores of this state. I believe there is an opening for the farmers to take possession of our own market. We know the apples can be raised, we know they will be raised, and if we had a central body, if we could be organized and had a board of managers, they might develop this market and



into these cities and towns of our own we could put many thousand apples and boxes of fruit every year.

I also believe that under organization we should have packing houses and storehouses, and those are things we need. If this great machine which has been used here this morning, the grading machine, and other makes, prove a success, as I am sure they will, it will go far towards solving the question of grading apples. Then, whoever handles the apples, whether it be the speculator or whether you organize and handle your apples yourselves, the use of this machine will lead to the erection of packing houses, and the apples of the men who produce small quantities of apples, the men with small orchards, will be brought together and put into these packing houses, and they can be put up in a uniform manner.

And again, we need more storehouses to hold our apples into the cold season. As I hinted a moment ago, when there is a large crop we rush it upon the market. We haven't any place to store the apples. Many of the farmers with 100 or 200 barrels of apples, cannot take care of them. A man with 500 barrels, unless he has made a special provision, is unable to store them through the cold season. So I believe that the organization work will develop into the organization of packing houses and storehouses. When we get to that point our apples will be come standardized. Of course the tendency of the apple packing law is in that direction. That is one of the reasons why it was enacted, but it never will be fully accomplished until we come to the point when our apples can be packed in packing houses, when the apples coming from different farms, different varieties, grown under different circumstances, can be brought together and packed at a common packing room.

We want to standardize not only the fruit itself, but also the brand, and that was the intention of the law, but under the condition that exists today, a No. 1 barrel of apples in one section and packed by one party, is a different thing from a No. 1 apple in another section, packed by another party. This is a matter which seems to me of serious import.

Again, we find men who want to mark the No. 1 apples with about four X's on them, or something of that kind. I suppose they think it adds to the merits of the apple in some way, but

I think we want to get rid of that thing, and that all the apples packed in the state of Maine that are branded as No. 1's should be marked under the same brand,—for instance, "No. 1 Maine Baldwins," and all the apples that are packed as fancies should be marked simply "Fancy."

I will say a word in regard to the new apple packing law. This law, passed by the last legislature, has created much discussion among the people of the state, and when the department, with whom it was left to enforce the law, commenced operations and sent out inspectors, we found a condition of affairs that in some respects had not been dreamed of. Our work this year has been largely educational, teaching men what the law is, what it means, and trying to induce them not only to follow its precepts, but even to do better. We find a large number of farmers who ship a few barrels of apples to market. Many of them seem to have very little knowledge of how to brand a barrel of apples. They do it with a pencil, in the old way, writing in a way that is almost illegible. Now of course it was one task of ours to try to counteract that, to try to induce growers and those people who were not in the habit of shipping many apples to use a printed form, a printed blank, or something that would look neat and would cover the law. We have succeeded in a measure, and it is our intention before another year to work this matter out and try to teach those men who ship apples in small quantities to brand them better. Of course the shipper of apples, the buyer, stencils his apples as a rule. But for these people who do but little business we hope that we may work out something that they may all use, and that when we come around to another crop we may not find the difficulty which we have found this year.

As I said before, we find buyers, speculators in apples, with all sorts of minds, and we found some buyers that didn't want to grade their apples, but mark them "unclassified," which we did not like. We found some who still wanted to continue the old practice of putting in poor apples and marking them No. 1, but as a rule the shippers have been ready to conform to the requests of the law. It seems to me, if they could get together themselves and agree upon a standard pack, so that a barrel of No. 1 apples might be pretty near like another barrel of No. 1 apples, it would be very helpful.

Our orchard interests are very important, and very briefly I have tried to show you that I believe it is for our interests to organize and to work in coöperation in packing and in marketing our fruit. I believe that the men of Maine, the growers of apples, should take it into their hands to market their own apples. I believe with this organization, if you can get the central organization, even if you do not go to the point of leaving the sale of the fruit in the hands of a central board, that with twenty-five or fifty of these local organizations, as much of our fruit is shipped to Europe, you could send a man to England and another to Germany to look out for your interests, and you surely need them. We are selling our fruit now to the first man that comes along; we are paying large freight rates on the railroads and steamers; we are paying a commission in England and we are paying wharf charges and other charges, and they are eating up the profits. We are putting our apples into the hands of strangers, commission men and others, to sell for us, and we know nothing about it, we have no control over it, we are not superintending it. This is wrong, so I will recommend that you organize. I recommend that you make some of these small organizations, and you men who are interested, who are leaders in the orchard movement, you men who have been successful, you men who bring these beautiful apples to these exhibitions, you are the men to whom we are looking to organize the orchard movement in this state. I recommend that you divide this state into districts, and that in each district you have a committee that shall see to it this winter, right away, before another crop comes around, and have an organization created.

I remember a little story of a Frenchman who came to this country for the first time. A friend of his in this country, a Yankee, took him to one of the leading hotels. The Frenchman had heard very much about pumpkin pie, that we love so dearly ourselves, and he said, "I want a piece of pumpkin pie." It was given him, and then he was asked how he liked it. Why, he liked it, but he said, "There seems to be ginger, or something of that kind in it." The answer was, "There is ginger in everything in America," and that is what we need in our orchard interests.

## THE FERTILIZATION OF APPLE ORCHARDS.

By DR. JOHN P. STEWART, Experimental Pomologist, State College, Pa.

The experiments started in 1907-8, by the Pennsylvania Experiment Station, have shown that the available supply of plant-food in an orchard may be the most important check on its production. By variations in fertilization alone, we have obtained average increases in yield ranging from 50 to 370 bushels per acre annually for the past 5 or 6 years. This means that, with a valuation of only 50 cents per bushel for the extra fruit, proper fertilization has given us average net returns running up to more than \$160 per acre annually. The accompanying increases in growth and general vigor of the trees have been almost as marked.

It is our present purpose to indicate briefly the general conditions under which these results were obtained, and to outline a simple plan for determining whether or not similar responses can be secured in any particular orchard.

At the outset we may say that our present results and deductions are derived more or less directly from the results of 13 experiments involving 10 soil types, 12 different locations, 2653 trees (excluding those strictly on cultural methods), and over 42,300 bushels of fruit in the last 6 years. Only six of these experiments, however, are entirely on fertilization and in bearing, and only the more important results from three of them will be considered here, although the results from all six are summarized. These six experiments involve six soil types, 800 trees, and about 15,300 bushels of fruit in the past 6 years.

THE AMOUNTS OF PLANT FOOD ACTUALLY TAKEN UP BY A  
MATURE ORCHARD.

Before examining the results themselves, however, it will be well to consider briefly the actual fertility requirements of a mature apple orchard. This is a matter upon which there is much misconception and misinformation. It is not uncommon to hear that apples consist almost entirely of water, one



writer having stated recently that they contain 98 per cent water, and hence have no need for any actual fertility or plant food. It is true that apples actually are about 84 1-2 per cent water on the average, but it is also true that in the remaining 15 1-2 per cent of solids much actual plant food is contained.

The real amount of this food can be approximated chemically by determining the average composition of apple wood, leaves, and fruit, and by applying these figures to what may be considered good annual amounts of these products. This we have done both for apples and for a 25-bushel crop of wheat, with the results shown in Table I. The annual weights for apples are based on a yearly production of 100 pounds each of wood and leaves, and of 14 bushels of apples per mature tree. All these amounts are distinctly less than those actually observed and reported, but inasmuch as they give an annual yield of 490 bushels per acre of 35 trees they are considered sufficient for the present purpose.

TABLE I. THE RELATIVE PLANT-FOOD DRAFT OF WHEAT AND APPLES.  
(In Pounds per Acre Annually, Based on American and German Averages.)

ANNUAL WEIGHTS.	Wheat grain Lbs. 1500	Wheat (Total) Lbs. 4200	Wood Lbs. 3500	Leaves Lbs. 3500	Fruit Lbs. 24500	Apple (Total) Lbs. 31500
Nitrogen (N).....	30.00	43.7	11.3	25.6	16.2	53.1
Phos. Acid (P <sub>2</sub> O <sub>5</sub> ).....	10.00	15.8	3.6	5.3	6.4	15.3
Potash (K <sub>2</sub> O).....	9.80	26.8	6.6	15.9	41.5	64.0
Lime (CaO).....	0.84	8.0	29.1	29.5	3.0	61.6
Magnesia (MgO).....	3.00	6.1	4.4	8.9	3.4	16.7
Iron (FeO).....	-	-	0.5	1.5	0.8	2.8

This table shows that in total food draft, the apples exceed the 25-bushel wheat crop in every constituent except phosphoric acid, and in it they fall behind only by half a pound. Notwithstanding this fact, apple trees are usually able to maintain themselves much better and longer than wheat. This is doubtless largely because of their much longer season of root-activity, their more natural demands,\* the annual return of most of the plant food in their leaves, and their ability to

\* This is especially marked in the case of the fruit as compared with the demands of the grain in wheat. For further discussion, see article by the writer in the Annual Report of the Pennsylvania Experiment Station for 1910-11, pages 447 to 449.



furnish all these materials indefinitely in the amounts and times required, and, unless proper assistance is rendered there must come a time when production is materially reduced and off seasons occur.

On the other hand, it may be noted that part of the orchard's product requires comparatively small amounts of the important elements. This is especially true of the wood, even when the annual production of mature trees is considered. Incidentally this accounts for the fact that young trees are much less likely to make a profitable response to fertilizer applications than those of bearing age. Such trees often respond very well to manure or to any other satisfactory mulch, as shown in three of our experiments considered elsewhere. This, however, is apparently due more to moisture conservation than to any direct increase in fertility.

The large amount of lime contained in the wood may have some significance, because, as shown later in several of our experiments, its application has resulted in considerable improvement in growth. In the fruit, however, very little lime is required, and hence its application should not be expected to affect the yields materially, and this corresponds with our field results. Moreover, the total effect of adding lime alone is surprisingly small, in comparison with the large amounts that are taken up. Either these amounts are merely drawn in and deposited mechanically, and hence are largely without physiological significance, or else the average soil is still able to supply the lime needed.

With iron the case is very similar. This element is almost universally present in agricultural soils and the total amount required is so small that its addition can scarcely be expected to produce any important effect. This also is borne out by such experimental results as are now available.

The fruit, on the other hand, carries a large amount of potash. From this, one might suppose that its addition to the soil would be very important in improving yields, and this idea has been widely proclaimed, especially by those considering only the chemical composition of the fruit. As indicated later, however, most orchard soils are already sufficiently supplied

with potash, and the chief shortages occur in nitrogen and phosphates, although the latter materials are actually required in considerably smaller amounts.

From these facts it is evident that there is comparatively little relation between response and total requirements in the case of plant food, and that something more than a knowledge of the chemical composition of the fruit and wood is needed before one can properly fertilize an orchard. Even with the additional knowledge of the composition of the soil, the problem is not much simplified, because it is impossible as yet to duplicate sufficiently the conditions existing in any soil. A chemist may determine the total amounts of plant food present, but he can not yet determine their actual availability to the trees with sufficient accuracy to be of much value.

The practical and proper fertilization of an orchard, therefore, becomes an experimental problem. The first stage of this problem involves general experiments for the purpose of developing the most promising application for general use, where fertilizers seem to be needed. This general formula can then be adjusted to the exact needs of the particular orchard involved, by means of a local testing plan. Our present data on these questions are as follows:

*Rates and Methods of Application.*—The rates of application that we have been using in the series of experiments in Pennsylvania are as follows: *Actual nitrogen*, 50 pounds per acre, carried about half in dried blood and half in nitrate of soda; *actual phosphoric acid* ( $P_2O_5$ ), 100 pounds, carried in acid phosphate, with "floats" and recently basic slag used in certain plats for comparison; *potash* ( $K_2O$ ), 150 pounds, carried at present in the high-grade muriate, with the high-grade sulphate and recently also the low-grade sulphate used in comparison in certain experiments. The manure is applied at the rate of 12 tons per acre, and the lime at 1000 pounds per acre. All applications are made annually. In the Johnston and Brown experiments considered below, the fertilizers are not cultivated into the soil, but are simply spread over the surface and left to be carried in by the rains. They are cultivated in the Tyson experiment. All fertilizer applications are made somewhat after petals fall, but the manure is put on any time during the spring.

These applications were naturally designed at the beginning of the experiments, before there was any definite experimental evidence as to the most desirable proportions and amounts to use. The amounts now advised for general use are shown later.

### RESULTS FROM THE JOHNSTON ORCHARD.

The following table gives the yields obtained from the above applications during the past 6 years. These results are obtained from an experiment with Baldwins, now 25 years of age, located on a Volusia silt loam in Lawrence county, north of Pittsburg. On first inspection these trees did not seem to be suffering especially from a lack of plant food, but they had not been bearing satisfactorily and their annual twig growth was averaging only about an inch, with occasional maximum growths of 5 or 6 inches. These rates of growth are continuing on the checks or unfertilized plats, but they have been practically tripled on the plats receiving proper fertilization. In estimating the influence of the treatments, the yields of the first year are uniformly excluded because they can never be materially affected by the applications of the first season.

TABLE II.—INFLUENCE OF FERTILIZATION ON YIELD.  
(JOHNSTON ORCHARD)

Yields in lbs. per plot and bu. per acre, 1908-1913.

Plot.	TREATMENT.	1908.	1909.	1910.	1911.	1912.	1913.	Totals last 5 yrs.—lbs.	Average Annual yield per A. —Bu.	Annual gain over average check.— Bu. per A.
1	Check.	90	675	2575	283	1024	1210	5767	138.4	—
2	Nitrogen and Phosphate.	528	6018	3263	7563	1225	3563	21634	519.2	348.7
3	Nitrogen and potash.	237	5257	1822	7816	696	3489	19080	457.9	287.4
4	Check.	446	1932	3168	617	1382	1777	8876	213.0	—
5	Phosphate and potash.	57	3089	3552	1227	1385	1207	10460	251.0	80.5
6	Complete fertilizer	759	6621	2108	8209	189	2320	19447	466.8	296.3
7	Check.	211	2008	1639	1362	1226	1635	7860	188.6	—
8	Manure.	278	3531	6149	4874	6698	1314	22566	541.3	370.8
9	Lime (and fertilizer.)	558	1216	3185	388	741	2174	7704	184.8	14.3
10	Check.	106	1266	3503	106	474	578	5929	142.3	—

The average check has yielded 170.5 bushels per acre annually.

The results in 1913 were very seriously interfered with by the heavy frosts that occurred on May 11 and 12. The frost effects were especially severe on plats 2, 3, and 6, as this was

their full-crop year, and their blossom indications were as good as or better than in 1911. They were estimated to have 100 per cent of a full bloom in 1913, while the other plats averaged about 30 per cent.

Looking at the total results, however, it will be noted that the average yields of the checks, or unfertilized plats, have run fairly uniform, producing an average annual yield of 170.5 bushels per acre during the last five years. Lime alone (at the rate of 1,000 pounds per acre annually) showed no improvement over the average check during the first four years, and it is only being brought above now by the addition of a complete fertilizer during the last two years. The phosphate and potash combination here is also poor, although it may have some advantage in location, as indicated by the fact that its adjacent check is the highest producer among them and is now averaging within 38 bushels of the phosphate-potash treatment. The growth on the latter plat also, is nearly 3 per cent less than that of the normal unfertilized plat, and its general appearance is in no way superior. It is evident, therefore, that these trees are still vitally in need of something, although it will be noted that they are receiving the fertilization commonly advised for orchards,—largely on the basis of chemical analyses.

This need is being quite thoroughly met on the adjacent plat 6, which differs from No. 5 only in the addition of nitrogen. The mere addition of nitrogen in this case has more than tripled the gain. Also it will be noted that wherever nitrogen appears in the treatments, very large yields are observed, and the foliage and growth of their trees are also very satisfactory,—the average gains in trunk girth ranging from 25 to 90 per cent.

Plat 2, receiving nitrogen and phosphate only, at the present time shows a distinctly better gain than No. 6, which receives potash in addition. This is directly connected with the almost complete crop failure that occurred in the latter plat in 1912, and it is also partly attributable to an unusual amount of crowding that is occurring among the trees of plat 6. It shows, however, that little or no additional potash is needed in this orchard, and that its addition thus far has actually been a detriment so far as the yields are concerned.



Phosphates are next in importance to nitrogen here, as indicated by the 9-bushel average deficit that occurs on plat 3 as compared with No. 6, when phosphorus is omitted in the former, and also by the high yields in plat 2. Manure, as a result of the extra large crop of 1912, when most of the other plats were having an off season, is now in the lead in this experiment, with the excellent average yield of 541 bushels per acre annually for the past five years, notwithstanding the frost injury of 1913. This gives an annual gain over the check of 370 bushels per acre, which is a very satisfactory exchange for 12 tons of manure. This benefit from manure is also largely due to its nitrogen content, the proof of which becomes more evident later.

*Time Required for Results to Appear.*—It is a common impression that long periods are required to determine the value and kind of fertilizer needed for an orchard. It will be noted here and in the following experiment, however, that both these facts were thoroughly evident in the season immediately following the one in which the fertilizers were first applied. In other words, both the value of fertilization and the kind of fertilizer needed were clearly evident in these two cases within but little more than a single year after the first application, and the general conclusions formulated then have not been materially changed by the results of the 4 or 5 additional years that we now have. In all other cases, except one, also, where these facts did not appear in the first two or three seasons of bearing, they have not appeared in the results of the six or seven years that are now available. This is of special importance in connection with the local tests recommended later, though in them we advise at least 3 years of trial for the sake of greater safety and greater stability in the resulting conclusions.

The one exception made above has been in the Myrard orchard, which did not show any special benefits from fertilization until the sixth year, chiefly because it was already being limited by a shortage in moisture.

#### RESULTS FROM THE BROWN ORCHARD.

This experiment is located in Bedford county on DeKalb stony loam,—a residual, foot-hill soil chiefly of sandstone ori-



gin, which is widely used for orchard purposes. This soil had been cropped very heavily before the orchard was planted. The trees are York Imperial, now 25 years old. They had borne some fairly good crops before the experiment was started, but they were no longer bearing well except on occasional trees, and their annual twig growth was very small,—averaging scarcely half an inch. This rate of growth has also been greatly increased by fertilization.

This experiment involves the same treatments as those in the Johnston orchard and four others besides,—those in plats 6, 9, 11 and 12. It also was started a year earlier, in 1907, and the results of that season are excluded in the present table for reasons stated above. The results for the past six years are given in Table III.

TABLE III.—INFLUENCE OF FERTILIZERS ON YIELD. (BROWN ORCHARD)  
Yields in pounds per plot, 1908-1913.

Plot.	TREATMENT.	1908.	1909.	1910.	1911.	1912.	1913.	Totals.	Benefit over normal.— Per cent.	Annual gain over av. check.— Bu. per A.
1	Check. ....	2402	25	4052	1588	453	3155	11675	-	-
2	Nitrogen and phosphate. ....	4153	588	5920	2219	7281	1170	21331	136.2	289.3
3	Nitrogen and potash. ....	3079	78	3838	1567	5402	963	14927	133.6	198.9
4	Check. ....	754	9	470	1260	309	942	3744	-	-
5	Phosphate and muriate. ....	1014	252	2381	1643	616	1501	7407	62.4	70.4
6	Phosphate and Sulphate. ....	292	266	1368	1299	356	1509	5090	-5.3	6.4
7	Check. ....	254	192	1115	1568	1117	1949	6195	-	-
8	Nitrogen phosphate and potash	1219	454	2436	3241	4931	1369	13650	122.5	206.1
9	Nitrogen. ....	863	1575	120	3082	1614	2721	9975	64.3	120.3
10	Check. ....	458	515	787	1448	222	2583	6013	-	-
11	Acid Phosphate. ....	104	892	787	794	64	2910	5551	5.2	17.1
12	Raw Phosphate. ....	100	124	581	703	123	3184	5815	2.1	23.3
13	Check. ....	266	257	2096	498	727	1692	5536	-	-
14	Manure. ....	621	1947	778	7334	1117	2422	14219	212.2	219.4
15	Lime. ....	152	160	1029	1060	288	2643	5332	49.3	12.0
16	Check. ....	246	36	943	387	166	813	2591	-	-

In general, we have the same types of results here as in the preceding experiment,—large gains from nitrogen, phosphates and manures, with relatively small effects from potash, and

\* In plats 2 and 3, the average gains over the "normal production" are given, on account of the unusual conditions near plat 1. Their annual yields were 4977 and 3483 bushels per acre respectively. The average check, omitting No. 1, has yielded 4816 pounds per plot or 112.4 bushels per acre annually.

Yields per acre in 1912. Plots 1 and 4 equal 73.2 bushels. Plot 2, picked, 1086.7 bushels. Total, 1397.9 bushels. Plot 3, picked, 925 bushels, total, 1037 bushels .48 trees per acre and 50 lb. to bushel are used. The Baldwins have produced less than 2-7 of the totals in this experiment, hence each plot is considered as slightly less than 7 trees or one-seventh of an acre.

again no advantage at all from lime. Incidentally there are greater irregularities in this experiment, owing somewhat to its greater size, but chiefly due to the presence of a woods on the mountain side above the first check plat, from which the latter is separated by a single row of trees. The leachings from the floor of the woods have acted much like a nitrogen fertilizer, and as a result the trees nearest the woods, although of the same age as those farther down, are considerably larger, thus accounting for the greater yields of the first 2 or 3 plats. This influence practically disappears, however, before the fourth plat is reached, as shown by its low yields which are those of a typical check.

The differences observed in the last two columns are due partly to these irregularities, partly to a certain amount of leaching and cross-feeding on the part of some of the checks in spite of separation rows below each treated plat, and partly to a different method of calculation. In one column, the benefit is figured on the basis of the normal production of the immediate plat concerned, which method is supposed to eliminate soil irregularities to the greatest extent. When the adjacent checks are being benefited by leachings or cross-feeding, however, this method fails to show the full benefit due to the treatment. The average check itself is not entirely free from the cross-feeding influences, since it only distributes their extra yields, and hence it is probable that some of the benefits indicated in the last column are still lower than they should be.

Returning now to the results themselves, and especially to those treatments not included in the preceding experiment, we may note first that the muriate of potash in plat 5 has given much better gains than the sulphate in the adjacent plat. This is contrary to the results of the Massachusetts experiment, but similar results are now being shown in all our experiments wherever this comparison occurs. Hence the difference in the Massachusetts experiment would seem to be due to something other than the difference in potash carrier. At present, therefore, we believe that the muriate is at least as efficient as the sulphate, and in view of the facts that it is cheaper, more soluble, and much less subject to "caking" in the mixtures, we are now using and recommending it for apples.

In plats 11 and 12, and in similarly treated plats of our other experiments, we see the apparent futility of attempting to improve yields materially by applying phosphates alone. The present slight gains on these plats have only been secured by the addition of nitrogen and potash to "complete" their fertilization during the past two seasons. This failure of the phosphates when applied alone is not due to the fact that phosphorus is not needed, nor can it be largely attributable to the absence of cultivation, as may be seen by comparing the results in plats 9 and 2. Nitrogen by itself in No. 9 shows an annual gain of 64.3 per cent or 120 bushels per acre, but when phosphorus is added in plat 2 these benefits are more than doubled. Phosphorus, as usual, therefore, appears to be next in importance after nitrogen in improving yields.

*The Permanence of Fertilizer Influence.*—It is another fairly common impression that the influence of fertilizers is transient and that, even where their effect is favorable at first, this effect soon wears out and may leave the soil worse than before. This evidently depends very largely on the character of the fertilization, and in this respect apples are not different from other crops. If the gains are induced by some caustic action of such materials as gypsum or lime when used alone, this may actually be the final result.

On the other hand, it should be noted that in plats 2, 3 and 8, where definite plant foods are being supplied, the effects of fertilization were greater in 1912, the sixth year of the experiment, than ever before. The steadiness and regularity of the increases also are especially notable in plat 8, which shows a distinct gain in every year except 1909, and in that year the yield would have been fully 1,000 pounds greater had there been sufficient moisture available to properly develop the fruits that were actually present. In 1913, all the yields were reduced here also by the unusually late and severe frosts in May.

In plats 2 and 3, only two fertilizer elements have been applied, and also the yields have been so large in the evenly numbered years that it was impossible to prevent some alternation with lighter crops in the odd years. This same general condition is evident to a considerable extent in the Johnston orchard. In other experiments, however, and especially in one primarily

on cultural methods in the Fassett orchard, with proper fertilization and with crops ranging from 200 to 600 bushels per acre, we have had relatively steady yields on Baldwins and Spies, similar to those in plat 8, which have been maintained for a period of five years without any important decrease appearing.

The unusual size of the 1912 crops on plats 2 and 3 in the Brown experiment deserves special attention. While their adjacent checks, 1 and 4, were showing an average yield of 73.2 bushels per acre, plats 2 and 3 were producing the tremendous average of 1,217.5 bushels per acre, and 1,006 bushels of this were picked fruit. The terminal twig growth of the checks, in the meantime, averaged scarcely half an inch for the season, while that of the fertilized plats, in spite of their enormous crops, averaged from 6 to 8 inches, with frequent terminals running up to 2 feet. All these differences were brought about solely as a result of differences in fertilization. The spraying, pruning, soil management, variety and age of trees, and all other visible features were just the same on the checks as on the fertilized plats.

#### RESULTS IN THE TYSON ORCHARD.

In the two preceding experiments, we have seen large annual gains resulting from certain fertilization, particularly that rich in nitrogen and phosphorus, regardless of whether these elements were carried in manure or in commercial forms. In these cases also, the gains from potash were relatively small or entirely absent. Thus far in the Tyson experiment, so far as the yields are concerned, we have practically the reverse conditions.

The trees in the latter experiment are much younger, being now but 15 years of age. The varieties are York Imperial and Stayman Winesap, the latter having been top-worked on certain York rows about 6 years after planting. The soil is a relatively heavy silt loam, and tillage and annual cover-crops have been maintained near the trees practically uniformly since the orchard was started. The annual growth and general appearance of all the trees in this experiment are much better than those of the average check trees in the preceding



experiments. Practically no fruit had been borne by these trees when our experiment was started in 1907, and there have been but two fairly full crops since then,—those of 1911 and 1913. The treatments are the same as those in the Brown experiment and the results are shown in Table IV.

TABLE IV.—INFLUENCE OF FERTILIZATION ON YIELD AND GROWTH IN EXPERIMENT 215. (TYSON ORCHARD)

Yield in pounds per plot, 1908-1913.

Plot.	TREATMENT.	1908.	1909.	1910.	1911.	1912.	1913.	Totals.	Benefit over normal.—Per cent.	Gain over av. check 4 years.—Bu. per A.	Growth gain over normal 6 yr.—Per cent.
1	Check.....	14	95	343	2053	549	3990	6947	-	-	-
2	Nitrogen and phosphate	26	73	301	2277	464	4645	7786	14.6	34.5	7.4
3	Nitrogen and potash....	43	115	418	3043	542	5264	9425	41.8	68.4	17.7
4	Check.....	21	54	260	1555	719	3886	6495	-	-	-
5	Phosphate and muriate	26	146	476	2828	495	5178	9049	45.4	59.0	8.1
6	Phosphate and sulphate	61	179	483	2352	975	4110	8160	37.1	36.0	2.3
7	Check.....	18	45	235	1777	862	2740	5677	-	-	-
8	Comp. fertilizer.....	21	74	300	2885	190	5132	8602	49.7	50.2	12.7
9	Nitrogen.....	17	83	229	1746	551	4159	6785	17.8	6.5	7.9
10	Check.....	17	89	150	1579	504	3547	5886	-	-	-
11	Acid phosphate.....	3	43	153	1359	655	3891	6104	-3.4	-8.4	4.4
12	Raw phosphate.....	4	62	164	2010	842	3825	6907	2.2	9.1	0.8
13	Check.....	31	46	103	1886	615	4511	7192	-	-	-
14	Manure.....	15	52	190	2333	262	5363	8215	16.3	41.3	14.6
15	Lime (and fertilizer)....	27	86	186	1765	1113	3620	6797	-2.0	6.5	-1.6
16	Check.....	10	76	115	1922	739	3947	6809	-	-	-

Average Check equals 6501 lbs. for 6 years and 6415 for last 4 years or 154 bushels per acre for last 4 years.

The relative growth of these trees makes both their yields and differences much less than those in the preceding experiments. With increasing age, it is probable that some of the results may be different, especially in view of the relative growth that is now being made under the different treatments. At present, however, certain facts are of interest.

In the first place, the comparative failure here of both manure and nitrogen is quite remarkable. The regular annual application of 12 tons of stable manure, in this case, has resulted in an annual gain of less than 15 bushels of apples per acre. During the same time, nitrogen alone has shown, and nitrogen and phosphates, which were so effective in the preceding experiments, here show an annual gain of only 34.5 bushels per acre,—but little more than enough to pay for the treatment.



Potash, on the other hand, in direct contrast to its effect in the experiment above, here shows a distinct gain in yield wherever it is applied. The best of these gains—the one in combination with nitrogen—is only 68.4 bushels per acre annually, but this is more than 40 per cent increase over the normal yield, and it shows a fair profit over the cost of treatment, besides giving over 17 per cent of an increase in growth. Potash applications, therefore, have evidently been of value in this orchard, even when those of manure and of nitrogen and phosphates were largely failing.

*The Action of Manure vs. that of Commercial Fertilizer.*—The above facts, taken in connection with those shown in the two earlier experiments, indicate that the plant-food action of manure is practically identical with that of a commercial fertilizer rich in nitrogen and phosphates. It also apparently indicates that the potash in the manure may be less readily available than that carried in commercial forms. The old controversy over the relative value of manure and commercial fertilizers, therefore, is without any particular significance, so far as plant food is concerned. Either type of fertilizer may be successful or either may be a failure, depending upon the particular conditions involved.

The manure, however, often has some additional value as a mulch. This naturally can not be duplicated by commercial fertilizers alone, though it may be duplicated by any other kind of mulch, as has been shown especially in our experiment in the Mynard orchard in Bradford county, and also in most of our cultural method experiments. The matter of availability also is often important, as manure cannot always be secured, and it is for this reason that the relation between manure and nitrogenous fertilizers should be well understood. Moreover, it sometimes happens that large and regular applications of manure may result in a distinct increase in the amount of blight, and also in an undue increase in the size of the fruit and in the amount of punky pitting in the flesh of the latter. In such cases, a reduction in the applications or the partial or complete substitution of a proper commercial fertilizer is desirable.

## A SUMMARY OF FERTILIZER INFLUENCES ON APPLES.

It is impossible in the present space to consider all our experiments singly, to the extent done with the three just considered. Before passing to the last stage of our discussion, however, it seems desirable to present a brief tabular summary of the fertilizer influences shown in six of the experiments, including the three just considered. This summary shows the calculated influences of the various fertilizer elements on the four most important characteristics of apples, viz., their yield, color, average size and amount of wood-growth. The relative values of the different elements during a five-year period, in terms of benefit over the normal results obtained without fertilization, are shown in Table V.

TABLE V.—INFLUENCE OF FERTILIZER ELEMENTS ON APPLES.

Average Benefits over the Normal Results without Fertilization 1908 to 1912.

(a) Expts. 215, 216 and 220.	Yield.	Color.	Size.	Growth.
	%	%	%	%
Nitrates in combination.....	62.7	-11.6	-0.7	10.43
Nitrates alone.....	32.5	-12.7	-4.3	15.51
Phosphates in combination....	20.2	-2.1	0.3	2.28
Phosphates alone.....	-10.7	2.7	-0.6	2.45
Potash in combination.....	15.1	3.2	5.8	3.67
Complete fertilizer.....	78.3	-15.4	5.2	17.67
Manure.....	75.9	-11.4	5.8	29.07
Lime alone.....	-8.24	-0.3	-2.0	6.31

(b) Expts. 336, 338 and 339.	1908-12	1909-12.	1909-12.	1908-12.
Nitrates in combination.....	74.5	-12.7	-0.4	27.00
Phosphates in combination....	33.5	-2.8	4.9	-0.23
Potash in combination.....	-3.6	1.4	7.1	2.79
Complete fertilizer.....	80.5	-15.6	5.2	29.63
Manure.....	168.8	-15.9	25.2	37.34
Lime alone.....	29.8	-5.4	15.9	15.48

Without going into details it may be noted that in general the same influences that have materially increased the yields have also increased the growth. In other words, our best growing plats have as a rule been our best fruiting plats. On sound, healthy trees, this will generally be the case *unless either occurs to an abnormal extent*, in which case the other may be somewhat reduced. Mild injuries may also stimulate yields at the expense of growth, and thus obscure the general rule.

In Table V, the most marked exception to the present rule appears in the case of the phosphates, especially in the lower section of the table. This may be connected with the fact that old wood especially is very low in phosphoric acid, as shown in Table I, and our present definite growth determinations are based upon increase in trunk girth alone. On twig growth, however, our observations indicate that phosphate additions have been very helpful, particularly in the Brown orchard, a fact which tends to bring it in line with the general rule just stated.

*The Control of Average Size.*—So far as fertilization is concerned, manure and potash are the only materials that have consistently benefited size. This influence of manure is doubtless very largely due to its mulching effect, since moisture makes up about 84.6 per cent of this fruit, on the average.\* The potash influence also, so far as it is a definite benefit, is probably exercised through the same medium, inasmuch as potash is credited with some ability to increase the osmotic power of the cells and thus enable them to compete more successfully for whatever water is present.

There is also a distinct possibility that the apparent benefit of potash on size may be largely due to the fact that it is associated with much lower yields than the other materials, especially nitrogen. Conversely, the failures of the latter to increase size may likewise be due to association with markedly increased yields.

This brings out the general proposition to which we have called definite attention elsewhere,† viz., that with a normal moisture supply and sufficient growing season, the dominant influence controlling size in apples is the number of fruits on the tree, after this number has passed a certain optimum or "critical point." This point, however, is relatively high, our data showing that even on trees up to 15 years of age, little or no correlation appeared until the number of fruits had reached 1,400 or more per tree. Above this point, proper

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\* See Table XVIII in the writer's article in the Annual Report of the Pennsylvania Agricultural Experiment Station for 1910-11, p. 435.

† See article referred to in footnote 3, pages 500-503.

thinning is the most important means of increasing the size of the fruit. Below it, the size can usually be markedly affected by moisture supply, cultural methods, manure, and possibly by fertilizers,—especially those rich in potash. The latter factors may also coöperate in such a way as to materially raise the critical point. In general, however, proper thinning and moisture conservation are the most important means of improving fruit size.

*The Control of Fruit Color.*—In Table V, it will be observed that none of the fertilizer treatments has resulted in any marked improvement in color. Slight and irregular benefits are shown by potash and by some of the phosphate applications, but nothing of any importance. The same is true of iron applications, so far as experimental evidence is concerned.

These facts again lead up to the general propositions that color in apples cannot be materially increased by fertilizer applications, and that their red colors are essentially dependent upon maturity and sunlight. Conditions that tend to increase one or both of the latter factors, such as late picking, open pruning, light soils and sod culture, tend to increase the red color. Opposite conditions decrease it.

These propositions make it clear why the nitrates and manure apparently injure color. It is simply done by retarding maturity and diminishing the available sunlight, as a result of the increased density of foliage. To determine the truth of this, in 1911 we left the fruit on the nitrate plats in the Johnston orchard until it had reached approximately the same degree of maturity as that attained by the checks when their fruit had to be picked on account of dropping. The delay required was fully three weeks,—from September 29th to October 19th, and even then the later fruit was picked with much more difficulty than that on the checks, besides showing a much lower percentage of fruits dropped. The amount of color on the nitrate plats at the later date was actually greater by 10 per cent than that shown on the checks at the time of picking.

The occasional marked increase that sometimes occurs in color as a result of spraying is largely explainable on similar grounds. The spray reduces the worminess and thus enables

the fruit to remain longer on the tree. It also may reduce the amount of foliage somewhat, as a result of spray injury, thus permitting more light to reach the fruit. In general, however, in improving color, chief reliance must be placed on those methods that tend definitely to secure fuller maturity on the trees and to get the maximum amounts of light to the fruit.

#### APPLYING PRESENT DATA TO INDIVIDUAL ORCHARDS.

In the three experiments discussed separately above, it was noted that the materials found most valuable in the first two were failures in the third, and vice versa. In still other experiments, we can show cases where no form of fertilization has yet shown a profit. These and other experiments prove conclusively the local nature of the problem. Hence even the experiments of others can offer no more than general advice on the fertilization of a particular orchard.

This advice can doubtless be made more exact after a personal examination of the orchard concerned, by one who is familiar with orchard fertilization work, or it may be done with greater certainty if the owner will note and look for some of the more important characteristics of orchards needing fertilization. The latter are best observed in late summer and fall.

In general, the characteristics of an orchard that is certainly in need of a fertilizer are those of starvation. They are usually sufficiently familiar to need no extended description. They are found most commonly in the older orchards, especially in those that have once borne well but are no longer doing so although still fairly free from important diseases or improper drainage. The foliage is sparse and pale in such orchards, and the annual growth stops early and averages short,—often not more than a half inch, and from this it may range up to two or three inches. In such cases, one can usually apply fertilizers rather liberally with practical confidence of profits, provided the varieties and general handling are right. Even in such an orchard, however, it is advisable to leave a small typical portion unfertilized to really determine the value of the treatment.



Under the opposite conditions, such as obtain in most young orchards or in any orchard that is still growing and fruiting well, and retaining its foliage until late in the season, fertilization is much less likely to show a profit. Even in these cases, however, there is often enough probability of benefit to warrant a limited trial of fertilization, but only over a relatively small area, and with most of the orchard left unfertilized as a check.

These trials are especially necessary, in the intermediate orchards,—those on the zone lying between the two extreme types just described. Occasionally this intermediate type will respond very strongly to fertilization without necessarily showing the characteristic marks, as is practically illustrated in the Johnston orchard.

#### A GENERAL FERTILIZER RECOMMENDATION FOR APPLES.

For preliminary use in orchards that are apparently in need of fertilization, on the part of those who are unable to carry out such a local test as is shown later, we are now recommending the general fertilizer indicated in Table VI. The fertilizers are stated in amounts per acre rather than in amounts per tree, because of the varying numbers of trees that are planted on an acre. The amounts per tree are readily obtainable, however, by dividing the present amounts by the given number of trees per acre. For young trees, these amounts may be reduced approximately in proportion to the area of soil covered, making this area correspond with the lateral distribution of the roots so far as possible.

TABLE VI.—A GENERAL FERTILIZER FOR APPLE ORCHARDS.

(Amounts per Acre for Bearing Trees)\*

NITROGEN 30 lbs. (N).	PHOSPHORIC ACID 50 lbs. ( $P_2O_5$ )	POTASH 25 to 50 lbs. ( $K_2O$ )
Carried in: 100 pounds nitrate and 150 pounds dried blood or in 150 pounds ammonium sulphate	Carried in: 350 pounds acid phosphate or in 200 pounds bone meal or in 300 pounds basic slag	Carried in: 50 to 100 pounds muriate or in 100 to 200 pounds of low- grade sulphate

\* For young orchards, reduce these amounts in proportion to area covered.

This table means that a fertilizer carrying about 30 pounds of actual nitrogen, 50 pounds of actual phosphoric acid ( $P_2O_5$ ) and 25 to 50 pounds of actual potash ( $K_2O$ ) should be applied to an acre of bearing trees. Where potash is not known to be lacking, the smaller amount should be used, or after a little testing it may even be omitted entirely. With the smaller amount of potash, the essentials of the present combination are carried in 500 pounds of a 6-10-5 fertilizer or its equivalent. In the usual ready-mixed fertilizers, the nitrogen is likely to be carried in ammonium sulphate, with which some liming may be necessary if many applications are made, and especially if leguminous cover crops or permanent covers are desired. In special or in home-made mixtures, the various elements may be carried in any of the materials indicated in the table.

In the work of this Station, the nitrogen is carried in the combination of nitrate of soda and dried blood indicated in the table. This combination carries about equal amounts of nitrogen in each material, and it thus gives a quick action as well as one that is prolonged well through the season. The nitrogen, being the costliest and most active ingredient, requires close watching and possible variations in amount, in order to get the most out of it. It may also be secured, wholly or in part, by the use of stable manure or leguminous plants where they are available. In the case of the other carriers indicated in the table, we have very little evidence on their relative values as yet and hence those that are actually least expensive or most convenient should be chosen. All applications should be made annually, subject to the variations indicated below.

*Time and Method of Application.*—The time of application we believe to be of distinct importance, especially in the case of nitrates. While our evidence on this is by no means complete, yet there are good indications that nitrates can easily be applied too early in the season and thus be wholly lost to the trees. Other evidence leads to the opinion that distinct harm may result from their application about fruit-setting time,—especially in the case of the peach. We feel, therefore, that the nitrates should be applied not earlier than petal-fall in apples and probably not later than the middle of July. In general,

about the middle of this period should do very well, though some of our most striking results have come from applications made as late as the 8th of July.

With the peach in Missouri, Dr. Whitten reports that the time of application is very important and that large increases in yield have been obtained from moderate quantities of nitrate of soda alone, when "applied at the right time."\* This is considered to be "after the main length-growth has taken place in the early summer." Such applications kept the trees from going into the rest period too early, and maintained a green and healthy condition throughout late summer and autumn without renewing the growth in twig length. It may also be noted that in the English work, at the Woburn Experimental Fruit Farm, July applications proved beneficial, while those made in February were of no avail.

An incidental advantage of the delayed applications appears in the fact that it gives an opportunity to vary the rate somewhat in accord with the size of the crop set on the trees. When the crop is light, much smaller applications are required, because of the natural tendency of the trees to develop a sufficient number of fruit buds in the off season. In the full years, on the other hand, the applications should be rather liberal, in order to prevent the total absence of a crop the following year and in the long run to steady the yields. Proper utilization of such a plan as this should save much in a series of years, and also enable one to secure the maximum return for the fertilization applied.

In the case of the mineral ingredients, with their lower solubility and slower action, the time of application is less important. Some careful observers in commercial work regularly apply their phosphates and potash in the fall, on their peach orchards, and believe that this gives best results. Thus far, however, we have felt that the time of application for the minerals is of relatively little importance, since they are rather quickly fixed in the soil, in any case, and they do not leach readily. We therefore apply them along with the nitrogen at the time considered best for it. Manure also can be applied at almost any time, excepting possibly late summer or fall, without danger of loss or of ill effects.

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\* See Proceedings of the Society for Horticultural Science 1911 p. 37.

The method of application that we have followed is merely to scatter the fertilizer or manure broadcast over the surface of the ground, taking care not to get it too close to the tree trunk, where there are few absorbent roots, and extending the applications well out beyond the spread of the branches. To conform more closely with the distribution of feeding roots, the rate of application is made heaviest in the central part of this area, or in general it is applied most heavily under the outer two-thirds of the spread of the branches. This fertilization may either be left on the surface to be washed in by the rains or it may be harrowed or lightly plowed into the soil. With all this done, it should be remembered that the fertilizer applied in any given season can hardly materially affect the yield of that year, since the fruit buds are formed in the latter part of the preceding season. Important results, therefore, should not be expected before the following season, at the earliest, and as indicated in some of our experiments, they may not appear until considerably later and still prove of value.

#### DETERMINING THE ACTUAL NEEDS OF AN ORCHARD.

The general fertilizer formula indicated above is for use only until the exact needs of the particular orchard can be determined. In other words, it is intended only to meet the immediate demands. If in the meantime one wishes really to answer the question of how to fertilize his own orchard, he can do so by following the plan outlined in Table VII. This plan is especially adapted to the needs of commercial orchardists and to "community" tests on the part of the smaller growers. Like other things of value, a test of this kind requires some work, but as yet it is the only way that one can become really acquainted with the needs of his orchard, and where the income from the latter is important, the time thus spent should be most profitable.

TABLE VII.—PLAN FOR LOCAL ORCHARD-FERTILIZER TEST.

(Pounds for a Mature Tree in Bearing.)

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1. Check (Unfertilized).
  2. Nitrate, 2½ lbs.; Dried blood, 3¼ lbs.; Acid phosphate, 10 lbs.
  3. Nitrate, 2½ lbs.; Dried blood, 3¼ lbs.; Potash, 2 lbs.
  4. Acid phosphate, 10 lbs.; Potash, 2 lbs.
  5. Check.
  6. Nitrate, 2½ lbs.; Dried blood, 3¼ lbs.; Acid phosphate, 10 lbs.; Potash, 2 lbs.
  7. Same as VI, plus lime, 12 to 25 lbs.
  8. Manure, 400 lbs.
  9. Check.
- 

This test should be located in a typical part of the orchard, and should include not less than 5 average trees of the same variety and age, in each plat. All the trees should be labeled and carefully measured at a fixed point on the trunk, and definite records of their growth and yields should be kept for at least 3 years. Frequently, good indications of the orchard's needs may be obtained in less time than this, as shown above in the Johnston and Brown orchards, but at least this amount of time should be allowed and more should be used when necessary.

The same time and methods of application should be followed as described above. The materials are indicated here in amounts per bearing tree instead of per acre as above, and the same proportionate reductions should be made for younger trees. In other words, if only a third of the ground is to be covered, then only about a third of these amounts should be used, if the rate of application is to be kept within proper bounds.

#### SUMMARY.

1. The experiments of The Pennsylvania Station have shown that the fertility needs of an orchard may be the most important check on its production. Variations in fertilization alone have resulted in average differences ranging from 50 to 370 bushels per acre annually for the past five or six years, depending on the experiment. These results were accompanied by similar differences in the growth and general vigor of the trees.

2. In the present discussion, we indicate briefly the methods and conditions under which some of these results have been



obtained, and outline a simple method of determining whether or not similar results can be secured in any particular orchard. The total plant-food requirements of a productive orchard are also considered, together with the more important effects that follow the application of the different fertilizer elements.

3. The total plant-food draft of a mature and active orchard is greater than that of a 25-bushel crop of wheat in every important constituent except phosphorus. It is practically inevitable, therefore, that sooner or later the output will be reduced or off seasons will be developed in any productive orchard because of a lack of sufficient plant food.

4. The mineral requirements of wood are comparatively low. This largely accounts for the fact that young trees usually do not make a profitable response to fertilizer applications, although they frequently respond well to manure or to other methods of conserving moisture.

5. The relative amounts of the various food elements required by the other parts of the apple plant are also of interest, but as a rule they are not especially reliable as bases for making fertilizer applications. The latter are best determined experimentally, as there seems to be very little relation between the response of the trees and their total chemical requirements.

6. Applications of nitrogen and phosphates and also of manure have been especially beneficial in two of our experimental orchards. In those orchards, potash at the same time has been of little or no service. These results are reversed at the present time in a third orchard, so far as yields are concerned.

7. The time required for results to appear has been surprisingly short in all cases where fertilization has proved to be really needed. In such cases, both the value of fertilization and the kinds needed were clearly evident by the middle of the second season, and no material changes have occurred since. In one case, however, in an orchard in the early stages of bearing, important benefits did not appear until the sixth year.

8. Neither acid phosphate nor "floats," when applied alone, have resulted in any important benefit. We are therefore "completing" the fertilization of their plats by the addition of

nitrogen and potash, in order to test further their relative values as carriers of phosphorus for trees. Basic slag was introduced into this comparison in 1912.

9. Lime also has failed in most cases, though it may have some value in aiding growth. In addition, it may have some indirect value in facilitating the growth of leguminous intercrops, and also in correcting a possible toxic action possessed by the basic radicals of a number of salts, some of which are present in commercial nutrients.

10. At present the high-grade sulphate in our experiments is showing no superiority over the muriate as a carrier of potash, but the reverse is usually true. The lower cost and easier handling of the latter, therefore, give it the preference. It is possible that the low-grade sulphate, or the 24 per cent. "double-manure salt," as it is often called commercially, may be superior on account of its magnesia content, but this has not yet been fully demonstrated.

11. The influence of proper fertilization is not transient. The gains from it have been greater in the sixth and last year of some of our experiments than in any earlier year. In one case, these gains have exceeded 1,100 bushels per acre. Where the crops of the full years are not too high, the yields usually have been greatly steadied by proper fertilization.

12. In all our experiments, the action of manure has proved to be practically identical with that of a commercial fertilizer rich in nitrogen and phosphorus. Their successes and failures have coincided with but two exceptions, and in those cases moisture rather than plant food was apparently the controlling factor. The commercial nitrates and blood have acted more quickly than the manure, and the potash in the latter has apparently been less effective than that in the commercial forms.

13. In general, the influences that have materially increased the yields have also increased the growth. This is true generally, unless either occurs to an abnormal extent. The phosphates seem to be a partial exception to this rule, and mild injuries also may stimulate yield at the expense of growth.

14. Manure and potash are the only fertilizing materials that have shown a consistent benefit on the average size of the fruit. This is doubtless associated with their favorable rela-

tions toward available moisture, which is the chief determiner of fruit size. Above a rather indefinite point, however, the size of the crop on the tree becomes the dominant influence on fruit size. Proper thinning and moisture conservation, therefore, are the most important means of improving the average size of fruit.

15. The red colors in apples can not be increased materially by any kind of fertilizer applications, though potash and possibly phosphates may be of some slight assistance. These colors are directly dependent upon sunlight and maturity, with the latter occurring preferably on the tree. Late picking, open pruning, light soils, sod culture and mildly injurious sprays, therefore, tend to increase the reds in fruits, while opposite conditions decrease them.

16. The retarding influence of nitrogenous fertilizers or manure on color makes it advisable to use them less freely on some of the red varieties, especially those in which the color comes on rather tardily, such as the York Imperial. On the lighter soils, or in localities with the longer growing seasons, this precaution is less important.

17. In the sixth section above, it has been noted that the fertilizing elements found effective in certain experiments were not so in others. In one of our experiments, no form of fertilization has yet shown a profitable response, and in two others such responses have come only from manure and mulches. It is evident, therefore, that the actual fertilization of a given orchard is still largely a local problem.

18. It is possible, however, to indicate the more prominent characteristics of orchards that are in need of fertilization, and to formulate a general fertilizer, based on present experimental results, that may be used in such orchards until more definite local data can be secured.

19. Present evidence indicates that the nitrates, or other specially soluble plant foods, are best applied somewhat after the fruit has set. In addition to greater effectiveness, this delay enables the rate of application to be varied somewhat in accord with the amount of fruit set, making the applications heavier when the crop is heavy and vice versa. In the long run, this plan should steady the yields and get maximum benefits from the fertilization applied.

20. The general fertilizer that we are now recommending is a combination carrying about 30 pounds of actual nitrogen, 50 pounds of actual phosphoric acid ( $P_2O_5$ ) and 25 to 50 pounds of actual potash ( $K_2O$ ). These are the amounts per acre for bearing trees. Only where potash is known to be needed, should the larger amount be used. Suitable carriers and formulas for obtaining these materials are given in Table VI and its context.

21. This general fertilizer can be modified and directly adapted to the actual needs of any orchard, by following the local testing plan indicated in the discussion. Such a test requires some work, but for those whose livelihood depends to a considerable extent upon their fruit, the time thus spent should be most profitable.

Ques. Is that soil full of potash?

Ans. Nearly all orchard soils are very full of potash.

Ques. Do you get as much potash from a sandy as from a clay soil?

Ans. No, there is much more potash in clay soils, but even a sandy soil is usually better supplied with potash than it is with any of the other elements.

Ques. In that experiment, you have lots of potash, anyway?

Ans. Yes, that is the situation exactly, that while the fruit of apples does require large quantities of potash, that is no sign that the addition of potash to a particular soil will result in a response from your trees. That soil may already have enough potash, but be limited by certain other elements, which in their actual requirements may be much below the potash requirement, so that essentially the fertilization of an orchard is the fertilization of a piece of ground. You have got to be thinking of the requirements of the piece of land all the time.

Ques. What is the size of the plots?

Ans. These plots are one-sixth of an acre each.

Ques. About six trees?

Ans. Eight trees, in this case.

Ques. Do we come to the conclusion that barnyard manure is always a good fertilizer for an orchard?

Ans. We don't want to come to any conclusions yet, because we have some data and some effects of barnyard manure



that are not so good as these. But you see barnyard manure is simply a complete fertilizer, plus a mulch. When you are putting on a barnyard manure, you are putting on a moisture conserver. Now, especially in the case of a young tree, moisture is usually the prime thing, so that it is generally better, in the case of young trees, to put a mulch of manure around them, than anything else you could do, because the manure will give them a certain amount of plant food, and much better, it will conserve moisture. But even though we were to prove that manure is by far the best orchard fertilizer, our next problem would be to get a sufficient supply of it. And that is often where the hitch comes, so it is only part of our problem here to find out what the function of manure is. On the other hand, as we go through these experiments you will see that wherever manure has given us especially good results, very similar results have been obtained by a fertilizer rich in nitrogen and phosphates.

Ques. In the experiment with nitrogen and phosphates you of course had tillage?

Ans. No; the tree limbs were too close together to permit it, and the ground was simply untilled.

Ques. Do you think there is any danger of adding to the acidity of the soil by the use of muriate?

Ans. No, I do not believe it will materially affect the acidity of the soil. Of course it might have a harmful influence in a long time, but I am very doubtful about it.

Ques. We are using some basic slag in our orchards. Is that beneficial?

Ans. Well, that of course would carry quite a little lime and might be of service. But notice that here again lime alone has been of no particular advantage to us.

Ques. Was 15 fertilized the same as eight, with the addition of lime?

Ans. Not exactly. Plot 15 received lime alone for the first five years and it has only come above the checks as a result of the fertilizer added for the last couple of years.

Ques. On what varieties was the experiment as to color tried, in which the fruit was left on longer on certain plots?

Ans. In that case it was Baldwin. With some other varieties, such as the York Imperial, we cannot do quite the same as we can with the Baldwin, because the color on the York is



later in appearing than it is on the Baldwin, and the delay caused by the nitrates is a little too much for the color to appear on those later coloring varieties, such as the York Imperial. But the same general principle applies to them as to the other; that is, it is simply a matter of maturity and sunlight to get the maximum amount of color on your fruit.

Ques. How many pounds of fertilizer will be required by a good large tree, with a heavy crop?

Ans. You can figure that in this way. About 500 pounds per acre of a 6-10-5 fertilizer will give you the plant food called for in our general recommendation. The balance depends on how many trees you have to the acre. If you have 40 trees per acre, it will mean  $12\frac{1}{2}$  pounds per tree.

Ques. That will be the limit?

Ans. Well, I have put on 50 per cent more plant food than that right along without any undesirable results. But I am not recommending any more than the present amounts because this is a good, rich fertilizer compared with the average. And it is the kind of fertilizer that brings returns, and it is returns that we are after,—net returns. I do not care to put on a fertilizer that costs me comparatively little, if I do not get anything back. You see I have been putting on lime there. It does not cost much, but it does not return anything at all and I was out my labor. The only kind of fertilizer I would care to put into an orchard is one that would show a margin of profit.

Ques. Do you ever use commercially mixed fertilizer for an orchard?

Ans. No. Our fertilizers are mixed at the factory, but they are all mixed under my personal supervision and I see what goes into every batch. Hence my fertilizers are essentially home mixed, but I use the factory machinery to do it.

Ques. I notice you say the difference in results between the fertilizer plowed in and that left on top was very slight. I would like to inquire if those plots were cultivated at any time of the year?

Ans. One of these experiments is cultivated every year in the typical orchard tillage system. That is in the Tyson orchard, a comparatively young orchard. The other two have not received any tillage at all since the experiment started, and yet you will notice what high yields we have obtained in them, with

the aid of a proper fertilizer. In the present experiments, whenever any cultivation was given to one plot, it was given throughout. Every other operation except the fertilization is kept absolutely uniform, so far as this is possible. It was in the other experiments, those directly on cultural methods, in which I had a comparison of the availability of fertilizer under tilled and untilled conditions.

Ques. Was grass growing in those orchards where there is no cultivation?

Ans. Some. Comparatively light sod in both of them.

Ques. You would recommend the application of the same number of pounds of fertilizer per acre, regardless of the number of trees per acre?

Ans. I think so. These amounts are supposed to cover practically the entire area. Now, as I say, we have used and we are using in our regular fertilization experiments, 50 pounds of nitrogen and 100 pounds of phosphoric acid, and 150 pounds of potash. That is because we didn't know when we started these experiments that potash was really so little needed. We were going on the data that was available at that time and the idea was that you wanted to use lots of potash in your orchard. Of course when you start out with a treatment, you have to continue it, when definite experiments are involved.

Ques. It is usually said that in using barnyard manure great advantage comes from the humus. This is fertilization without any cover crops or plowing. What about the humus supply of those trees?

Ans. Well, I don't know that there is very much difference between the different plots. At any rate, you notice that we are getting excellent yields merely from the fertilization, and without the tillage or cover crops.

Ques. I have always been taught that it was the humus that we were looking for in general farming, and that without humus we could not get results. We must keep a supply of humus, or our land would all run out. You are getting no humus stored and I would like to ask how many years it has been going on, and whether I could produce good paying crops under the methods you recommend?

Ans. That brings up the question of the permanence of fertilization. There is often a general impression that the influ-

ence of fertilization is relatively short, and where it does do a little good at first, that it will soon run out in its influence. That might be the case if your gains are coming from caustic materials, such as gypsum or lime or something of that sort, which act merely as whips on the soil and push it to a further state of exhaustion. In such case you might get gains for a year or two or three, and then your soil would drop back. But if you are putting actual plant food upon the soil and using a really suitable fertilizer, there is certainly no reason whatever for the influence to decrease with age, and in the second set of results that I showed you I could have pointed out that in the sixth year of that experiment we had by far the largest gains we ever had in it. If it hadn't been for the frost this year in the first orchard, we would have gotten our largest gains from it also in the sixth year, judging from the indications.

Also, in another experiment on general farm crops that is going on at the college, which is now in its 33d year, I might say that the fertility of those plots that have received a proper fertilization has been absolutely maintained for 33 years and, in some cases, it is even better than it was when it started, and they have never had a pound of manure or outside vegetation put back upon them. I certainly would not want to say anything that would upset the system of a whole community, but these are the results that our experiments have shown. I am not certain our results will apply to your conditions, and I would not recommend you to change your methods all over until you have tried the change on a comparatively small portion and seen what it will do, and then, if it works with you as it has worked with me, why extend it over the balance and cut out that extra work.

*Prof. Woods:* We want to set over against these experiments which are upon particular soil in Pennsylvania, experiments upon another soil in New York that were carried on for 16 years, in which absolutely no trace of benefit whatever could be found from the use of fertilizer.

*Prof. Stewart:* Well, since this contrast has been raised, I want to call attention to the difference between the results in New York and those in Pennsylvania. The results in New York were obtained from a single soil, and our results are obtained from ten different soil types and a far greater number of trees. Their

result was from a single experiment, or to be more exact, they have two experiments, which are both on the same soil. The older of those experiments involved nothing but a comparison of wood ashes against nothing. It was a wood-ash treatment against no treatment. The other experiment involves the various fertilization materials, but it is on young trees and really includes only seven fruiting years. Also, if you will notice their report, you will see that the total production involved in their second experiment is much less than the average production of almost any one of our ten experiments in a single year. The cropping strain, therefore, has not yet reached their second group of trees, hence no definite conclusions are justified on it as yet. I didn't expect to make this comparison, but it is simply a matter of going into the figures for it, and it seems to be necessary in order to get our data into the proper light. In other words, the real experiment on fertilization in New York is not to be compared in extent, yields, soil types, definiteness of results, or in number and range of ages of trees, with the experiments in Pennsylvania, and anyone who will look carefully into the exact data involved cannot come to any other conclusion.

Ques. You didn't state the amount of barn manure per acre?

Ans. Twelve tons is what we have been using, but I don't recommend more than eight.

Ques. What about the cost of your fertilizer per acre?

Ans. Fertilization of this sort runs between \$10 and \$12 per acre, depending on the market prices. Now that, as I say, is a relatively rich fertilizer, and I would not recommend anybody to put it on extensively until he has tried it out and found out for his own situation whether it will give him as good results as it has us. At the same time, notice that we have put these fertilizers on, not in one place, but in several places, and have obtained practically harmonious results. We do have one or two experiments that as yet have shown no material gain from fertilization, but we are not saying that fertilization is of no consequence in any orchard, simply because we have one or two experiments that have failed to respond as yet. If we had no experiments but these two, we would not consider ourselves in a position to give advice on the subject of fertilization. It is only when a man conducts an experiment that shows something definite that he is in a position to say much about it, it seems to me.



Ques. Is that same formula applicable to old orchards that you want to start the wood growth on?

Ans. Yes. We have used that in an orchard that is 36 years old,—practically this same formula.

I will say, in the first year of taking up an old orchard, run out badly, with much dead wood in it, to bring it up to a healthy condition the first thing to do would be to get the dead wood out of it, of course, and then bring it down, if it is too high, try to get some bearing wood below, and then use an application of about eight tons of manure, if you can get it, or else use this very fertilizer.

And I want to say here that we have run practically this same fertilizer right alongside of annual applications of 12 tons manure for six or seven years, depending on the experiment, and the fertilizer has generally held right up, both in wood growth and in fruit yields.

Of course we have some failures in some of our experiments, but we are getting good results in nearly all of them when we give them time. We are getting them, and they will get results in that second experiment at Geneva, too, if they give it time.

Ques. Should the same amount of fertilizer be used in an old orchard?

Ans. I should think so. You notice that our general formula indicates amounts per acre for bearing trees. This is mature trees. For young trees you should reduce these amounts.

Ques. Wouldn't you recommend the cultivation of an orchard for conserving the moisture as a good plan?

Ans. Certainly, you have got to conserve the moisture in an orchard, but I do not know that cultivation is always the best way to conserve moisture. That is my point. As a matter of fact, that is what we will bring out tomorrow, in discussing the influence of cultural methods.

Ques. How many trees do you advise to take for a test plot?

Ans. I should not use less than six trees of a single variety in each plot. Better use them in double rows and use six trees as a minimum. The double rows cut down the cross feeding and leaching and other possibilities. Use six to eight trees apiece, same variety, absolutely uniform in every way possible. They do not have to be right side by side, so you can exclude a certain tree if it is not right and take in another one a little further



along and make everything as uniform as possible. Then I would measure the trees. And it is the diameter of the trunk at a certain definite point that is the best index of tree growth. We have tried every other system, leaf weights, and twig growths, and various things and have discarded them all as practically worthless, with the exception of the trunk diameter or trunk circumference at a definite point.

Ques. How do you fix that point?

Ans. We put a nail in the trunk at the point we want and let it stand out about three-quarters of an inch, and when the tree grows out around it, we either pull it out further or put another one in. Then the fruit should be actually weighed, or measured with extreme care, from every tree and recorded to that tree and the record kept from year to year; then at the end of three or four years, sum up those records and see what those plots have done. Often, of course, where we have the striking results such as I have shown you here, a man does not have to keep a very close record to know what is happening. You can see them as far as you can see the orchard. But in many cases you cannot expect such tremendous results, and in such cases the definite records are needed.

Ques. Have you found that your fertilized plots were more susceptible to disease than others?

Ans. Not materially so, except once in a while our most vigorously growing plots have been more subject to blight.

Ques. What do you call blight?

Ans. The ordinary fire blight.

Ques. Do you have any winter injury caused by fertilization?

Ans. I do not believe I have had a particle of winter injury from any treatment that we have applied there. And I was expecting to have some, because we put on our nitrogen fertilizer in some cases as late as the 8th of July, but I have not noticed even the tip end of a twig that seemed to be injured by winter injury.

Ques. What would be your idea on the conditions here?

Ans. It might cause some winter injury here, but that is another thing that can be determined by trying; and I do not know how it can be really determined in any other way. If the soil about the trees is well supplied with moisture, there is usually less danger from the direct freezing type of winter injury.

ANNUAL BUSINESS MEETING, THURSDAY,  
NOVEMBER 20.

Meeting called to order by President Keyser.

REPORT OF SECRETARY.

During the year there have been three meetings of the executive committee.

The first was in Augusta, Jan. 22nd. It was voted to hold the Annual Exhibition during the week beginning the third Tuesday in November.

Matters relating to the legislation recommended at the last annual meeting were talked over.

A vote, by letter sent to each member of the executive committee, was in favor of holding the 1913 exhibition in Lewiston, November 18-20.

The second meeting of the committee was held in Dover, June 19.

Voted to offer \$50 in prizes at the Bangor Fruit Show, to be held in November, 1913, and to divide it as follows: \$25 for the best display of fruit, \$15 for the best barrel of apples and \$10 for the best box of apples.

The third meeting was held in Auburn, June 27th.

The premium list was revised. A score card for all box exhibits and one for all barrel exhibits was adopted and ordered printed in the premium list.

One Field Meeting was held during the year. By invitation, it was held in the forty acre orchard of C. D. Paine in Dover. There were addresses by Dean Leon S. Merrill, A. K. Gardner and W. H. Conant, also a demonstration in pruning by G. A. Yeaton.

The lessons illustrated in this orchard were many,—namely, spraying, pruning, cultivation and especially the treatment of apple tree canker. The orchard was badly infested, but by diligent and practical work, Mr. Paine now has the disease practically under control.

The attendance was good, although the weather was unfavorable.

The society now has the largest membership in its history,—150 life members and 105 annual members.

The interest being on the increase, the fruit growers realize more than ever that they must continue united in one state organization, in order that they may be able to work with determination and confidence for the procuring of necessary legislation and coöperation.

The Farm Demonstration work being carried on by the University, is solving many problems and convincing the farmers of the state, that Maine is still in the real beginning of fruit culture.

The several Fruit Growers' Associations are proving that by coöperation in buying and selling, the grower is greatly benefited. They are also demonstrating the benefits resulting from cultivation, pruning and spraying, and especially noteworthy are the lessons drawn from honest packing, grading and marking of their fruit, thus obtaining high prices for their products.

When there is a willingness, on the part of all orchardists, to coöperate with the Pomological Society, we may be able to undertake the question of transportation, storage and other facilities for marketing with more certain success than in the past.

The annual appropriation from the state for the work of the society was increased from \$1000 to \$2000, by the last legislature. This increase, and also the changes in the apple law, relating to the better grading, packing and marking of apples, were brought about by the untiring efforts of the president, who spared neither time nor influence in the securing of these results. That the society appreciates his determined efforts and feels deeply grateful, he may feel assured.

During the year the secretary has received the annual reports of practically all the State Horticultural Societies of the United States. Maine, however, has not been able to return the courtesy, as the reports for the year 1912 have just been received from the printers.

We are encouraged to believe that the report for 1913 will be ready for distribution at an early date.

Respectfully submitted,

E. L. WHITE.

Voted, that the report be accepted.

The treasurer then made his report, which was accepted.

# REPORT OF TREASURER, FOR THE YEAR 1913.

1913

## RESOURCES.

Jan.	1	Interest from First National Bank, Farmington....	\$12 00
	2	Interest from Bonds, Stockton Springs.....	22 50
July	1	Interest from First National Bank, Farmington...	16 00
	2	Interest from Bonds, Stockton Springs.....	22 50
Sept.	25	Received from State stipend.....	220 38
Nov.	19	Received from E. L. White, advertising space....	22 00
	18	Received from E. L. White, advertising space....	237 00
Dec.	26	Received from State stipend .....	655 43
	31	Life membership fees.....	60 00
	31	Annual membership fees.....	133 00
		Received from State stipend.....	940 37
Total receipts .....			<hr/> \$2,341 18

## DISBURSEMENTS.

## Orders

No.	1	The Alden Studio, photos.....	\$2 00
	2	W. F. Dunham, post cards.....	3 00
	3	Brunswick Record, envelopes.....	1 25
	4	The Times Company, post cards.....	3 25
	5	W. W. Brown, 500 stamped envelopes.....	10 62
	6	W. F. Dunham, printing.....	1 75
	7	W. F. Dunham, post cards.....	2 90
	8	Auburn Free Press, posters.....	12 00
	9	Will E. Leland, expenses.....	3 28
	10	E. F. Hitchings, expenses .....	3 20
	11	Leon S. Merrill, Federation dues.....	6 00
	12	W. F. Dunham, post cards and slips.....	5 75
	13	Blethen House, Dover, field meeting expenses.....	9 50
	14	Lewiston Journal Company, posters.....	4 50
	15	George A. Yeaton, field meeting expenses.....	5 64
	16	E. F. Hitchings, expenses.....	2 50
	17	E. F. Hitchings, expenses.....	2 48
	18	H. L. Keyser, expenses.....	34 82
	19	Will E. Leland, expenses.....	6 31
	20	W. F. Dunham, printing.....	5 75
	21	Maine Farmer, printing 300 letters.....	3 00
	22	John H. Look, expenses.....	5 08
	23	W. H. Conant, field meeting expense.....	8 23
	24	E. L. White, expenses.....	14 32
	25	E. L. White, salary.....	75 00
	26	Wallace S. Ladd, stationery.....	5 56
	27	Lewiston Journal, circular letters, (3,000).....	7 50

28	Loring, Short & Harmon, envelopes.....	1 50
29	Charles E. Nash & Sons, letter heads.....	2 00
30	Loring, Short & Harmon, envelopes.....	5 00
31	Lewiston Journal, premium list.....	48 94
32	Charles E. Nash & Sons, printing.....	35 30
33	Charles E. Nash & Sons, letter heads.....	2 00
34	Merrymeeting Grange, storage.....	2 00
35	W. W. Brown, postage.....	33 12
36	Cecil Libby, labor .....	1 50
37	W. H. Woodworth, speaker.....	54 50
38	William H. Wolff, judge.....	30 06
39	Mrs. Edna McLaughlin, jellies, (lost).....	2 00
40	Charles Dunton, labor.....	2 00
41	H. L. Keyser, expenses.....	40 97
42	H. L. Keyser, tickets and expenses.....	33 30
43	Lewiston Daily Sun, notices.....	4 00
44	J. P. Stewart, speaker .....	104 92
45	B. S. Brown, expenses.....	5 36
46	L. A. Lewis, carpenter.....	26 40
47	Perez Burr, judge .....	1 00
48	F. L. Rackley, labor.....	1 50
49	Katherine M. Lynch, judge.....	2 00
50	A. B. Andrews, services with lantern.....	8 00
51	J. R. Reny, cloth.....	3 52
52	M. C. R. R., freight .....	3 18
53	W. F. Dunham, printing.....	1 00
54	Bangor Fruit Show, prizes.....	50 00
55	Lewiston Journal, notices .....	5 50
56	E. L. White, expenses.....	22 35
57	E. L. White, salary.....	75 00
58	Will E. Leland, expenses.....	4 55
59	New DeWitt Hotel.....	159 50
60	E. F. Hitchings, expenses.....	4 93
61	Donald Reddick, speaker .....	51 28
62	G. A. Drew, judge.....	45 45
63	George A. Yeaton, judge.....	25 00
64	Dr. B. N. Gates, speaker.....	45 15
65	M. C. R. R., freight.....	2 34
66	L. C. Mendall, labor.....	2 00
67	Homer N. Chase, barrel of apples.....	3 09
68	Lewiston Journal, programs.....	61 75
69	Edward N. Furbush, speaker.....	24 80
70	Earl W. Sawyer, printing.....	17 50
71	L. E. Randall, trucking.....	25 00
72	F. H. Morse, expenses.....	6 10
73	F. A. Ricker & Son, 3 barrels of apples.....	9 35
74	A. R. Prince, music.....	10 00
75	Maine State Bookbinding Co.....	28 75



76	W. H. Cornforth, stenographer.....	38 20
77	Miss L. B. Raynes, stenographer.....	43 20
78	Premiums .....	436 50
79	Transfer permanent funds .....	60 00
80	S. H. Fulton, speaker .....	64 53
81	E. L. Lincoln, salary .....	25 00
82	E. L. Lincoln, expenses .....	20 95
83	Harry L. Plummer, photos.....	1 50
84	Charles J. Brand, speaker.....	2 80
85	L. J. Clark, stationery.....	4 75
86	Lewiston & Auburn Electric Co.....	60
87	J. E. Alexander, paper .....	2 40
		<hr/>
Total expenditures .....		2,080 08
Cash on hand .....		252 10
		<hr/>
		\$2,331 18
Permanent fund for the year 1912.....		\$2,070 00
Life membership fees, 1913.....		60 00
		<hr/>
Total .....		\$2,130 00
Permanent fund invested as follows:		
Four shares stock First National Bank, Farmington.....		400 00
Two bonds, Stockton Springs .....		970 00
Deposit in Savings Bank.....		760 00
		<hr/>
Total investments .....		\$2,130 00

Respectfully submitted,  
 ELLIS L. LINCOLN,  
*Treasurer.*

Voted, that a committee of three be appointed to draw appropriate resolutions on the death of the late ex-vice president, D. D. True. The following were appointed: E. L. Lincoln, Wayne; G. M. Twitchell, Auburn; D. H. Knowlton, Farmington.

The following officers were elected for 1914: President, Wilson H. Conant, Buckfield; 1st vice president, Frank H. Taylor, Winthrop; 2nd vice president, George A. Yeaton, Norway; treasurer, Thomas E. Chase, Buckfield; secretary, E. L. White, Bowdoinham.

Member of executive committee for three years, H. L. Keyser, Greene.

Member of Experiment Station Council, H. L. Keyser, Greene.

Delegates to Maine Federation of Agricultural Societies: E. E. Page, East Corinth; W. H. Conant, Buckfield; E. L. White, Bowdoinham.

Representative to New England Fruit Show, Homer N. Chase, Auburn.

Voted, that the president appoint three committees of three members each, the expenses of these committees to be paid by the society subject to order of the executive committee, which committees shall take under consideration the matters of storage, transportation and membership. The following were appointed:

Storage—Robert H. Gardiner, Gardiner; J. Henry Rines, Portland; Homer N. Chase, Auburn.

Transportation—E. H. Libby, Auburn; W. H. Cornforth, Auburn; R. L. Cummings, West Paris.

Membership—A. K. Gardner, Augusta; Will N. Savage, Waterville; W. G. Conant, Hebron.

Committee on resolutions reported as follows:

*Resolved*, That, as members of this society, we bear testimony to the faithful and efficient services of our retiring president, Mr. H. L. Keyser. Without his devoted services the success of our apple packing law could hardly have been possible, while his organizing ability, manifested in our annual programs, has added greatly to the value of these sessions.

*Resolved*, That we thank our officers for the efficient management they have given in the conduct of its affairs and especially for their well directed efforts in securing much needed legislation.

*Resolved*, That we approve the efforts of our officers and the Commissioner of Agriculture to enforce the law passed by the last legislature to secure an honest packing of Maine fruit and furthermore, that we believe it to be for the interest of all Maine fruit growers to coöperate with the authorities in bringing about this most desirable result.

*Resolved*, That we recognize and appreciate the assistance of the press of Maine and would express our special obligations to local managers and writers for extended reports of these sessions, thereby insuring the widest possible reading.

*Resolved*, That our hearty thanks are due the Chamber of Commerce, the city of Lewiston and all who have so well contributed to the success of this annual session.

*Resolved*, That we urge upon our state officials and fruit growers the importance of strengthening our present apple-packing law to provide more general inspection and in addition to unite for such legislation as will insure more complete spraying and protection from pests and fungus diseases.

*Resolved*, That we commend to the favorable consideration of Maine fruit growers the recommendations of President Keyser for coöperation in securing better and more general storage and marketing of our fruit.

D. H. KNOWLTON,  
G. M. TWITCHELL.

Voted, that the report be accepted.

Committee on resolutions on the death of D. P. True reported as follows:

#### RESOLUTIONS OF RESPECT.

*Whereas*, God in his infinite wisdom has again entered our society and removed from our midst our fellow member, Davis P. True, be it

*Resolved*, That we express our sorrow and mourn the loss of one who has served our society as one of the officers for a number of years.

*Resolved*, That we as members of the Maine State Pomological Society extend our sympathy to the family of our departed member, and commend them to the Great Ruler, for comfort.

*Resolved*, That a copy of these resolutions be sent to the family and also published in the annual report.

ELLIS L. LINCOLN,  
G. M. TWITCHELL,  
D. H. KNOWLTON,

*Committee on Resolutions.*

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### THE INFLUENCE OF CULTURAL METHODS AND COVER CROPS, ALONE AND WITH FERTIL- IZATION, UPON THE YIELD, GROWTH AND COMMERCIAL QUALITY OF APPLES.

By DR. J. P. STEWART,

Experimental Pomologist, State College, Pa.

In the present discussion I wish to bring before you the principal actual results that we have obtained in Pennsylvania during the past six or seven years from the use of various cultural methods on different soil types and in orchards of different ages. Many of these results are different from what might have been predicted before the experiments began, and they also differ materially from many of the present horticultural writings and teachings. These matters are not dependent on opinions or preferences, however, and our sole duty has been to present the various questions to the trees themselves and then

to secure and interpret their answers wholly impartially and without the slightest personal interest in the outcome.

The results considered here are from nine experiments, located in different parts of the state on seven different types of soil. They also involve 1991 trees, 588 of which (in Experiments 331, 333 and 337) were planted expressly for the present experiments. Four of the experiments,—Nos. 217, 218, 219, and 221—were started in 1907 and the remainder in 1908. The data on growth are obtained from annual measurements of all the trees at definite points on the trunks, and the data on yields are secured from the total annual production of fruit. This fruit is studied from three view-points,—those of yield, color and average size. The total amount of fruit thus examined during the past six years is 1,350,392 pounds or over 27,000 bushels. The location, soils, present ages of trees, and other general features of our cultural-method experiments are shown in Table I.

TABLE I.—LOCATION AND OTHER DATA ON THE ORCHARD CULTURE EXPERIMENTS, CONDUCTED BY THE PENNSYLVANIA STATE COLLEGE.

Expt. number.	County.	Soil Types.	Varieties.	Age 1913	Number of trees.	Number of treatments.
217	Franklin...	Montalto loam.....	York Imp. & Gano.....	20 yr....	358	12
218	Franklin...	Hagerstown.....	York & Albermarle....	14 & 21	400	12
219	Bedford...	Frankstown stony loam	York, Jonathan, B. Davis and Gano.....	10 to 12	320	12
221	Wyoming..	Chenango fine sandy loam	Baldwin & Spy.....	40.....	115	6
331	Centre....	Hagerstown silt loam...	Baldwin, Stayman & York	5.....	288	8
333	Centre....	Hagerstown silt loam...	Baldwin, Stayman & York	5.....	120	12
336	Chester...	Chester loam.....	Smokehouse & Stayman	10.....	105	3
337	Mercer....	Volusia silt loam.....	Baldwin, Spy & Rome..	5.....	180	4
338	Lawrence..	Volusia silt loam.....	Baldwin.....	24.....	105	3
Totals	7	7	10		1991	

1. The addresses of the owners of the orchards in which these experiments are located are as follows: 217, J. H. Ledy, E. Fayetteville; 218, Ed. Nicodemus, Waynesboro; 219, Jos. R. Sleek, New Paris; 221, F. H. Fassett, Meshoppen; 331 and 333, Department of Experimental Pomology, State College; 336, A. D. Strode, Westchester; 337, Rev. A. M. Keifer, Greenville; 338, J. B. Johnston, New Wilmington.

2. Experiment 333 is devoted entirely to a comparison of cover crops, in which their relative effect on the trees and the ultimate reasons for these effects are the prime objects of study.

## GENERAL PLAN OF THE EXPERIMENTS.

The general plan of our cultural-method experiments is shown in Figure 1. Its chief purpose is to determine what combinations of culture and fertilization give the best results under the different conditions involved, and eventually to determine why the various results are obtained. The plan is followed in full in the first three experiments of Table I, with only minor deviations in such matters as number of trees and relative positions of the plats. In the other experiments, for various reasons, certain of the treatments have been omitted, and in the young orchards of Experiments 331 and 337, plats involving intercrops have been added. In Experiment 333, the entire attention is given to a comparison of cover crops, one of which is a permanent cover and hence has received tillage only at the beginning of the experiment. The essential features of these modifications can be seen in the treatments listed for the different experiments in the tables that follow.

I Clean tillage 40 trees	IV Tillage and cover crop 40 trees	VII Sod-mulch 40 trees	X Sod 40 trees
II Tillage and manure 20 trees	V Tillage, cover crop and manure 20 trees	VIII Sod-mulch and manure 20 trees	XI Sod and manure 20 trees
III Tillage and commercial fertilizer 20 trees	VI Tillage, cover crop and commercial fertilizer 20 trees	IX Sod-mulch and com- mercial fertilizer 20 trees	XII Sod and commercial fertilizer 20 trees

Figure 1. Plan of the Pennsylvania Orchard Experiments on Cultural Methods, Cover Crops and Manures.

As indicated in Figure 1 and Table I, our complete experiment on cultural methods compares the four principal methods of managing orchard soils and it is duplicated, wholly or in part, in several localities on a wide range of soils. Each method occurs without fertilization and also with it in two forms, both applied annually. The stable manure is added at the rate of 12 tons per acre, although 8 tons annually is probably ample, and this amount has given excellent results on other portions of some of the orchards in which our experiments are located. The commercial fertilizer carries all three of the elements usually considered important, at the rates of 30 pounds of actual



nitrogen, 60 pounds of "phosphoric acid" ( $P_2O_5$ ), and 100 pounds of "potash" ( $K_2O$ ) per acre. About half of the nitrogen is carried in nitrate of soda and the other half in dried blood, about 100 pounds of the former and 150 pounds of the latter being required. The phosphorus is carried in acid phosphate, thus requiring about 400 pounds, and the potash in the high-grade muriate, which contains about 50% of  $K_2O$ , and hence requires 200 pounds.

At the present retail prices, such a fertilizer costs about \$12.80 per acre. Here again our results indicate that a reduction of at least 10 pounds in the phosphoric acid and of 50 to 75 pounds in the potash would usually be equally efficient, and would effect a saving of about \$2.60 to \$3.65 per acre. In ordinary practice also, part or all of the nitrogen might be obtained from leguminous crops or by the use of manure, although this has not always proved to be really economical. The manure used in our experiments,—at \$2.50 per ton, which is about as low as it can be obtained and applied,—costs nearly  $2\frac{1}{2}$  times as much as the fertilizer we are using and its benefits do not average materially better. Considerably more actual plant food is also being added in the manure, since the amount applied should carry about 120 pounds of nitrogen, about 80 pounds of  $P_2O_5$ , and 110 to 115 pounds of  $K_2O$ .

All the tillage plats are plowed early in May and are kept cultivated until about the middle of July, when those receiving the cover crops are seeded to such plants as crimson or medium red clover, and hairy vetch. On the other tillage plats, cultivation is stopped at about the same time as on those receiving cover crops, but no seeding is done and only such vegetation as comes up naturally is obtained.

On the mulch plats, all herbaceous growth remains in the orchard and it is mowed at least twice during the season. The first cutting is raked to the trees as a mulch, and the second is left where it falls. In the older orchards also, about three tons per acre of outside materials, such as old straw, swamp hay, buckwheat straw, or other vegetation, are brought in annually to form an additional mulch around the trees. In the younger orchards, much less outside material is needed, and in some of them a satisfactory mulch has been maintained from the growth between the rows, after one or two initial applications from the

outside. Our mulch method, therefore, differs somewhat from the so-called "Hitchings" plan, the difference being primarily in the maintenance of a definite mulch under the trees, with materials brought from outside sources when necessary. As a means of conserving moisture, the definite vegetative mulch is greatly superior to the other plan.

Incidentally it may be noted here that some definite protection against mice must be provided in any mulching system. This can be done by screens, poisons, or proper coatings, and especially by maintaining a clear space for at least a foot out from the bases of the trees. In ordinary practice also, the best results with the mulch system can doubtless be secured by using leguminous plants of relatively low moisture draft, such as hairy vetch, to act as the permanent cover and to furnish at least part of the mulch. Although essentially an annual, this plant frequently lasts fairly well for two or more seasons after a single seeding.

This is especially true after the soil gets properly inoculated, and where the winters are not too severe. The latter are apparently withstood better when the vetch is planted along with rye, or some similar plant than when planted alone. Incidentally, we know of one orchardist who is apparently maintaining hairy vetch permanently by letting it grow until the seed has formed in considerable abundance and then giving it a rather thorough discing about midsummer or whenever a sufficient number of seeds have matured.

#### RESULTS OF EXPERIMENTS IN YOUNG ORCHARDS.

These experiments—on trees planted for the purpose—naturally have not yet fruited to any important extent. They are showing considerable differences in growth, however, and it is the latter feature that will be considered here.

The effects on wood growth obtained from various treatments in one of the young orchards at the College are shown in Table II. These trees were planted in the spring of 1908, in a much depleted soil of limestone origin. In the first 5 plats, the soil was plowed in the fall of 1907, and prepared about as for corn before planting in the following spring. In the last three plats, no tillage was given either immediately before planting or afterwards. The trees were simply planted with a spade

in the old exhausted pasture, a mulch of about 100 pounds of straw was placed around each tree, and screen protectors were added to provide against injury from mice. Since then there have been one or two slight additions to the mulch from outside sources, but for the most part it has been maintained satisfactorily by the intergrowth in the manner indicated above. The average gains made by the trees under these different treatments for the first five years are shown in Table II.

TABLE II.—INFLUENCE OF CULTURAL METHODS ON GROWTH.

(YOUNG ORCHARD.)

(Average Increase in trunk girth, first 5 years, in Expt. 331.)

Plat.	TREATMENT.	Av. gain.	Gain over clean tillage.	
		Inches.	Inches.	Per cent.
1 <sup>3</sup>	Clean tillage . . . . .	3.68	—	—
2	Tillage, intercrop and cover crop . . . . .	3.67	-.01	-0.27
4	Tillage and cover crops . . . . .	3.61	-.07	-1.90
5	Tillage, cover crop and manure . . . . .	4.51	0.83	22.56
6	Tillage, cover crop and fertilizer . . . . .	3.92	0.24	6.53
7	Sod-mulch . . . . .	4.61	0.93	25.27
8	Sod-mulch and manure . . . . .	4.86	1.18	32.07
9	Sod-mulch and fertilizer . . . . .	4.85	1.17	31.80

3. The numbers of treatments here correspond with those stated in Figure 1, except in the present Plat 2. It involves an intercrop, and hence is different from any treatment named in our general plan.

In this table and also in the field, it is very evident that the untilled trees have made the best growth in the present experiment. This may be partly due to the absence of root pruning under the mulch, but the chief benefit thus far seems to be connected with moisture conservation, rather than with the plant-food added. This appears in the fact that the only tillage treatment which has shown much improvement in growth is the one in which manure is applied, and even its gain is surpassed by the mulch alone in Plat 7. In Plats 7 and 8, where the moisture is sufficiently retained by the mulch, thus practically eliminating the moisture-conserving effect of the manure, the gain of the latter over the mulch alone is only a quarter of an inch on the average, or a gain of about  $6\frac{1}{2}\%$  which is apparently all that may be properly credited to its plant-food effect. This fertility benefit is practically duplicated by the fertilizer applications of Plats 6 and 9, the remaining benefit on the latter plat being apparently due to the mulch.

In Plats 1, 2 and 4, there is very little difference,—less than a tenth of an inch in the averages. The slight advantage now possessed by the clean tillage alone is again probably connected with its lower demand for moisture as compared with the cover crop used in Plat 4. It is notable, however, that the net influence of the cover crops in this case has been to check rather than to benefit the growth of the trees. Up to the close of the fifth year, therefore, the cover crop has made no visible return for itself, so far as the trees are concerned. It has consisted chiefly in a mixture of red and crimson clover, sown about July 10th to 20th, and only the last three covers have been really good. In Plat 2, the intercrops have been potatoes, peas, mangel wurzels, and sweet corn, with the fertilization considered best for each. They were kept at a reasonable distance from the trees, and the intervening spaces were cultivated until midsummer and again when the cover crops were sown, which was after the intercrops were removed and hence was usually rather late. None of the intercrops have proved especially profitable, and neither have they proved any serious detriment to the trees, as compared with the other tillage methods, since their check to tree growth is slightly less than that of the cover crops sown in the midsummer. These results are similar to those obtained by Emerson at the Nebraska Station, and reported to the close of the second year in 1903, in Nebraska Bulletin 79, pages 14 to 17.

#### RESULTS IN THE MERCER COUNTY ORCHARD.

Additional data are available from another experiment started by the Station in 1908 in Mercer County, the latter portion of which is similar to the experiment just considered. In the present experiment, the treatment of Plat 12 corresponds with No. 2 in the experiment just considered. The usual tillage and cover crops have been maintained on Plats 1 to 12, rye being used chiefly as the cover on account of the lateness of some of the intercrops. Plat 13 has received tillage alone, and 14 has been mulched as in Experiment 331, although oftener. The results on growth are shown in Table III.



TABLE III.—INFLUENCE OF FERTILIZATION AND CULTURAL METHODS ON GROWTH. (YOUNG ORCHARD.)

(Average increase in trunk girth, first five years, Expt. 337.)

Plat	TREATMENT.	Average increase.	Gains over normal growths.	
		Inches.	Inches.	Per cent.
1	Check (unfertilized).....	3.28	—	—
2	Nitrogen and phosphate.....	3.78	.44	13.17
3	Nitrogen and phosphate.....	3.51	.11	3.24
4	Check.....	3.47	—	—
5	Phosphate and potash.....	3.94	.14	3.68
6	Complete fertilizer.....	4.73	.60	14.53
7	Check.....	4.47	—	—
8	Manure.....	4.57	.32	7.53
9	Lime (and fertilizer, 1912).....	4.61	.58	14.39
10	Check.....	3.91	—	—
11	Tillage and cover crops.....	3.38	.28	7.78
12	Tillage and intercrops.....	3.60	—	—
13	Clean tillage.....	3.72	.13	3.62
14	Sod-mulch.....	4.32	.72	20.00

Here again the trees receiving the mulch are showing decidedly the best growth, though their advantage is not quite so great as in Experiment 331. The cover crop in this case is proving slightly better than clean tillage alone, probably because the relative importance of moisture and plant food seems to be reversed here. But the advantage on the cover crop plat is still too small to show any profit. The intercrop here has been vegetables,—chiefly potatoes, beans and peas. They show the lowest tree growth of any of the cultural methods, but their deficiency is very slight and it is probably chiefly due to their location, which has been somewhat wetter than that of the others. This has now been corrected by tile drainage.

As already intimated, the conservation of moisture seems to be of less importance than plant-food in this orchard. This is not surprising to one familiar with this Volusia type of soil and also with local conditions. Even at that, however, the response to fertilization shown in the first ten plats is somewhat greater than we had expected in so young an orchard, and in a similar experiment at the College this response is not duplicated. The latter result is more natural in the case of young trees for several reasons. The trees have been making their particular demands for a relatively short time, most of the food of the leaves is annually returned to the soil, the mineral content of wood is rather low, and in reality comparatively little of it is being formed in a young orchard. For these reasons we usually



do not expect much response to fertilization in the case of most young trees.

The response here is rather irregular, but in general it indicates the value of nitrogen and phosphates, which corresponds with our results on this same type of soil in the Johnston orchard, in which older trees and both yields and growth are involved. The chief irregularity here appears in Plats 8 and 9, in which manure is showing less effect and the lime more effect than would naturally be expected in the light of their behavior in our other experiments. This irregularity appears to be much greater in the percentages than in the actual average gains on these two plats—an effect which is brought about by the abnormally strong growth on the check Plat 7, possibly due in part to leaching or cross-feeding from Plats 6 and 8. Beyond this, however, we can offer no further explanation of the present results in this experiment, and we are awaiting further returns.

#### RESULTS FROM COVER CROPS AT THE PENNSYLVANIA STATE COLLEGE.

Similar data, bearing especially on the value of cover crops, are available from another of the experiments at the College. The crops used in this experiment are stated in Table IV.

These crops are plowed under annually and the usual orchard tillage is given on all plats excepting the alfalfa. The latter plat was plowed only at the beginning of the experiment, at which time the soil was limed, manured and inoculated, and otherwise prepared as usual for alfalfa. The liming also has been extended to the other plats. The initial stand of alfalfa was unsatisfactory and it was therefore turned under at the beginning of the next season and immediately seeded again to the same crop. Since then nothing has been done with this plat, except to cut the alfalfa two or three times a season and apply it as a mulch about the trees. The mulch obtained in this way has been considerably more than was needed to keep down the growth immediately around the trees, and some of it, therefore, has been hauled away. As the mulched area enlarges, however, this condition will not continue. The relative value of the various crops, as indicated by the growth of the trees, is shown in Table IV.

TABLE IV.—INFLUENCE OF COVER CROPS ON TREE GROWTH.  
(YOUNG ORCHARD.)

(Average increase in trunk girth, first 5 years, in Expt. 333.)

Plot.	COVER CROP.	Average increase.	Gain over original girth.	Rank.
		Inches.	Per cent.	
1 a	Medium red clover.....	3.82	183.65	12
2 b	Mammoth red clover.....	3.73	192.28	11
2 a	Alsike.....	3.78	204.32	9
2 b	Crimson clover.....	4.34	245.40	3
3	Hairy vetch.....	4.42	245.56	2
4 a	Cow peas.....	3.94	175.11	13
4 b	Soy beans.....	4.18	201.94	10
5	Oats and peas.....	4.28	235.16	7
6	Rye.....	4.07	233.91	8
7	Millet.....	4.42	238.92	5
8	Rape.....	4.27	239.89	4
9	Buckwheat.....	4.58	237.30	6
10	Alfalfa.....	5.09	306.63	1

Here again, it will be noted that the mulched and untilled trees are distinctly superior to the others in their growth. Also, it is shown that alfalfa can be safely and satisfactorily used, in a young orchard at least, when its growth is prevented from competing directly with the tree roots by means of a mulch.

For use as a permanent cover and as a basis for a mulch, alfalfa is thus shown to be very satisfactory. Its power of nitrogen fixation and its perennial habit are much in its favor, when used as stated above, but its strong affinity for moisture and also for soil nitrogen would suggest caution in using it in direct competition with the roots of the trees. More work is needed on this point, however, and much more work is needed on the relative values of various plants for permanent orchard covers and mulches, and on the best methods of handling them. Almost nothing has been done along the latter line. Hairy vetch, as noted above, has many of the qualities most needed for this purpose, but definite and comparative data on it thus far are lacking.

Among the annual covers and those used along with tillage, the best tree growth has been made in connection with hairy vetch. This is not surprising when we remember that it furnishes nitrogen and has a very low demand for moisture,—two of the most important requisites for a plant to be associated with trees. The surprising moderation of its moisture draft, in comparison with other crops, can be seen readily in the furrow slice, when these plats are crossed with the plow. We

frequently observed that the soil under the rye and alsike plats was practically dust dry, while that under the adjacent vetch was turning up almost too wet for plowing. Under such conditions, the ordinary clovers have proved to be about intermediate in the moisture content of their soils, with the advantage somewhat in favor of the crimson,—especially after seed formation had begun, with its accompanying check on vegetative growth,—while the conditions under the frost-killed annuals were more nearly like those under the vetch.

The importance of these differences in moisture can be appreciated when it is remembered that in the average soil it is only the moisture in excess of 8 or 10 per cent that is available to plants. On some of these plats, therefore, the trees were evidently practically in a state of drought, while those on the vetch and similar plats were almost too well supplied with moisture.

In the present experiment, crimson clover has come next to vetch in its relation to tree growth. This again is not surprising, but the low position of the mammoth and medium red clovers is wholly unexpected, since they seem to be very much like the crimson clover in their more important characters. It seems quite probable that the growth deficit on the latter plots is due to some unfavorable feature of the immediate soil concerned, rather than to any action of the clovers themselves, because even their growth has not been very satisfactory until the last two seasons. It is also possible that the greater amount of winter-killing on the crimson clover plats, which evidently reduces the growth and loss of moisture in the spring, may have something to do with its advantage.

In the case of all the other crops, the present effects on the trees are doubtless largely due to their relative influence on the moisture supply, which has already been noted as very important in this orchard, in the discussion of Experiment 331. The rye influence has not been as bad as might be expected, probably because it was usually sown late,—not earlier than the first of September,—and it has always been mowed immediately around the trees as soon as it showed any important growth in the spring. The cow peas and soy beans, on the other hand, are sown some time between June 25 and July 5. The period of cultivation, therefore, is much reduced for the trees and the crops make a vigorous growth, thus undoubtedly competing rather

seriously for moisture and materially checking the fall growth of the trees. The gains in nitrogen and humus from these crops, therefore, have evidently not yet compensated for their apparently unfavorable reductions in the moisture supply.

The gains with the rape, millet and buckwheat are larger than might be expected, and in the case of the latter they may be partly due to a slight advantage in location. Here again, we may note that our results with this class of crops are not materially different from those of Emerson at the Nebraska Station, which were published in 1903 and 1906 in their *Bulletins* 79 and 92. These crops are all frost-killed annuals, though the rape is much more resistant and usually some of its plants survive the winter. As a group, therefore, they offer little or no competition for moisture in the spring, which is apparently much to their credit. Their competition in the fall also, has not been so serious in the present experiment as that of the other frost-killed crops.

As winter covers, the millet is the best of the present three,—chiefly because of its greater ability to hold the snow,—and the rape is the poorest. The latter usually withers away and disappears almost completely during the winter. The buckwheat, also, furnishes but little direct protection to the soil, though it does seem to exert a mysteriously good influence on the physical condition of the latter, making it looser, mellower, and more congenial to moisture. Its general effect, however, is hardly so good as that of millet, and even the latter crop, for the average Pennsylvania conditions, does not yet impress the writer nearly so favorably as hairy vetch, and possibly crimson clover. From present indications, however, and in view of the low cost of their seed, either millet, rape, or buckwheat is likely to prove much more valuable in many cases than many of the plants now sown for orchard covers.

#### RESULTS IN ORCHARDS OF EARLY BEARING AGE.

The next group of results is obtained from orchards ranging from 6 to 20 years old, if we begin with the age of the youngest at the start and finish with that of the oldest at present. The experiments directly concerned in this group are the first three indicated in Table I, and each involves the entire plan shown in Figure 1. These experiments were started in 1907, in orchards already planted, and hence it was not always possible



to get all the conditions as uniform as desired. Such irregularities as are present, however, have been corrected in our calculations so far as possible. Owing to some serious attacks of "collar-rot" and other diseases also, one of these experiments, No. 217, was terminated in 1912 and a similar one was started in another section of the orchard.

The results thus far obtained from these three experiments on the yield, growth, average size and color of apples are shown in Tables V, VI, VII, and VIII, respectively. The yields, color and average size are given for the five-year period from 1908 to 1912, inclusive, thus omitting the yields of 1907, which naturally were affected but slightly, if at all, by the treatments of the first year. In growth, however, the averages are given for the entire six-year period beginning with 1907. The yields are obtained by weighing and recording all the fruit from each tree, and the growth is determined by measuring all the trees practically annually at definite points on their trunks.

The data on average size and color are obtained by the random sample method. This means that as the fruit is picked and weighed, a sample is taken at random from each basket, the samples being of sufficient size to make at least two bushels of fruit of each variety from each plat. This sample is weighed, counted and carefully examined for amount of color, and the average weight and the per cent of color shown by the fruit in each sample are calculated from the data thus obtained. The averages for each year on all characters except growth are brought together and averaged to obtain the present data on each experiment. These mean values in turn are averaged in each of the present tables to obtain the various "table" averages shown in them. In the growth tables, the figures given are the average increases in trunk girth for the whole period covered. The results secured are shown in the following tables.



TABLE V.—INFLUENCE OF CULTURAL METHODS ON YIELD.  
(YOUNG BEARING ORCHARDS.)

(Average annual yields per acre during last 5 years, 1908-12.)

TREATMENTS.	Expt.	Tillage.	Cover crop.	Mulch.	Sod.
		Bushels.	Bushels.	Bushels.	Bushels.
Without fertilization.....	217	96.0	121.0	174.3	140.1
	218	129.5	110.4	108.5	110.4
	219	21.9	23.6	55.5	19.9
Average per acre.....	-	79.1	85.0	112.7	90.1
Rank.....	-	4	3	1	2
With manure.....	217	169.1	151.5	213.0	260.5
	218	155.8	145.2	105.9	115.9
	219	52.3	30.2	59.1	35.0
Average per acre.....	-	125.1	109.0	126.0	137.1
Rank.....	-	3	4	2	1
With complete fertilizer....	217	170.4	195.3	218.2	187.7
	218	182.3	133.3	115.3	126.6
	219	47.5	53.7	44.4	33.5
Average per acre.....	-	133.4	127.6	129.3	115.9
Rank.....	-	1	3	2	4

TABLE VI.—INFLUENCE OF CULTURAL METHODS ON GROWTH.  
(YOUNG BEARING ORCHARDS.)

(Average increases in trunk girth, 6 years, 1907-12.)

TREATMENTS.	Expt.	Tillage.	Cover crop.	Mulch.	Sod.
		Inches.	Inches.	Inches.	Inches.
Without fertilization.....	217	9.10	9.69	9.05	8.92
	218	9.89	10.09	10.71	8.78
	219	10.01	8.94	10.87	7.65
Average gain.....	-	9.67	9.57	10.21	8.45
Gain over sod.....	-	14.4 %	13.3 %	20.8 %	-
Rank.....	-	2	3	1	4
With manure.....	217	9.88	9.13	9.19	9.06
	218	11.15	10.32	10.52	10.55
	219	11.65	11.20	11.75	10.06
Average gain.....	-	10.87	10.22	10.47	9.89
Gain over sod.....	-	28.6 %	21.0 %	23.9 %	17.0 %
Rank.....	-	1	3	2	4
With complete fertilizer....	217	9.58	10.22	10.29	8.51
	218	9.38	9.63	11.25	9.63
	219	11.19	11.37	11.92	10.08
Average gain.....	-	10.05	10.41	11.15	9.41
Gain over sod.....	-	18.9 %	23.2 %	32.0 %	11.4 %
Rank.....	-	3	2	1	4

TABLE VII.—INFLUENCE OF CULTURAL METHODS ON THE SIZE OF APPLES.  
(YOUNG BEARING ORCHARDS.)

(Average weights of fruit in ounces, 5 years, 1908-12.)

TREATMENTS.	Expt.	Tillage.	Cover crop.	Mulch.	Sod.
		Ounces.	Ounces.	Ounces.	Ounces.
Without fertilization. ....	217	4.90	4.82	5.22	4.94
	218	5.68	6.01	6.14	5.68
	219	3.81	3.73	4.74	4.30
Average size. ....	-	4.80	4.85	5.37	4.97
Gain over sod. ....	-	-3.4%	-2.6%	8.04%	-
Rank. ....	-	4	3	1	2
With manure. ....	217	5.53	4.98	5.42	5.42
	218	6.15	6.26	5.91	5.84
	219	4.63	4.43	4.83	4.56
Average size. ....	-	5.44	5.22	5.39	5.27
Gain over sod. ....	-	9.5%	5.03%	8.44%	6.03%
Rank. ....	-	1	4	2	3
With complete fertilizer. ....	217	4.85	4.99	5.72	5.41
	218	5.48	6.00	6.44	5.83
	219	4.55	4.27	4.52	4.63
Average size. ....	-	4.96	5.09	5.56	5.29
Gain over sod. ....	-	-2%	2.4%	11.9%	6.44%
Rank. ....	-	4	3	1	2

TABLE VIII.—INFLUENCE OF CULTURAL METHODS ON THE COLOR OF  
APPLES. (YOUNG BEARING ORCHARDS.)

(Average per cent of fruit colored one-half or more, 5 years, 1908-12.)

TREATMENTS.	Expt.	Tillage.	Cover crop.	Mulch.	Sod.
		Per cent.	Per cent.	Per cent.	Per cent.
Without fertilization. ....	217	71.1	67.5	77.1	81.0
	218	76.4	83.2	74.8	76.0
	219	77.5	72.6	82.9	86.2
Average color. ....	-	75.0	74.4	78.3	81.0
Per cent gain over tillage alone. ....	-	-	-0.7	4.4	8.1
Rank. ....	-	3	4	2	1
With manure. ....	217	64.0	68.8	64.3	68.9
	218	64.5	73.9	69.6	74.7
	219	66.0	74.5	63.3	77.2
Average color. ....	-	64.8	72.4	65.7	73.6
Per cent gain over tillage alone. ....	-	-13.6	-3.5	-12.35	-1.8
Rank. ....	-	4	2	3	1
With complete fertilizer. ....	217	64.6	64.6	69.7	72.7
	218	74.7	75.7	69.6	70.0
	219	70.0	71.6	74.2	77.3
Average color. ....	-	69.8	70.6	71.2	73.3
Per cent gain over tillage alone. ....	-	-6.9	-5.8	-5.1	-2.2
Rank. ....	-	4	3	2	1

These results are naturally much more complicated than those in the recently planted orchards considered above. The differences also are less distinct and much less uniform in their trend in many cases, and the relative values of the several treatments are more variable in the different soils and localities. Part of this variability is doubtless connected with the natural unsteadiness, in yield especially, that is generally characteristic of trees in their early stages of bearing. The extent and importance of the latter influence, however, can only be determined by further results and perhaps by additional experiments.

But notwithstanding the present difficulties, a few points are fairly clear. In the first place, it may be noted that the sod treatment has uniformly resulted in the poorest growth and the best color of any of the treatments. This is doubtless chiefly due to its usual accelerating influence on maturity. On yield thus far, sod has usually exerted a stimulating influence, a fact which is especially noticeable when it occurs in connection with manure. The exceptionally high average in this sod manure treatment, however, can be traced primarily to the unusual yields in Experiment 217, as in the other two experiments it is a notable fact that four out of six of the other treatments with manure are against this average. The same is true of the sod average obtained in the series without fertilization, as shown in Table V.

The present yield benefits from sod, moreover, are evidently being secured primarily as a result of mild injury, as is shown by the fact that the sod trees are making the least growth of any of the treatments, and in the series receiving commercial fertilizer they are also showing the lowest average yield. Grass sod growing over tree roots, therefore, must generally be considered as an objectionable treatment.

#### THE CROP VALUE OF A MULCH.

In terms of fruit, it will be noted in Table V that our annual mulch applications alone have given an average increase of about 35 bushels of apples in two of the experiments, and have resulted in no gain over sod in the third. These differences might be greater if the trees were larger and in another experiment on older trees, as shown in Tables IX and XII, it will be observed that the mulch has given a maximum annual gain of

76 bushels per acre for the last four years. In the absence of fertilization during three of those years, the average annual gains from the mulch were 22 bushels per acre, which also happens to be the average shown by it for all three of the experiments in Table V.

When fertilization has been added in these "adolescent" orchards, however, the benefits from the mulch have usually been reduced, and in the presence of manure they have disappeared entirely, so far as the average yield is concerned. In other words on these medium sized trees, the three-ton mulch of straw or other extra material has apparently been heavy enough to interfere somewhat with the action of the manure. This interference has been less with the commercial fertilizers, especially in the case of growth, and it does not appear at all in Experiment 221, as shown later.

From the present data, therefore, it appears that such a mulch as we are using can not be relied upon for annual gains of more than 20 to 35 bushels of apples per acre in the younger orchards, and not more than 75 or 80 bushels in those more mature. From this, it is evident that one is restricted to the use of relatively cheap materials in maintaining the mulch, if it is expected to show a definite profit. Where the materials for it can be grown between the rows, or can be obtained in such form as swamp hay, buckwheat straw, or possibly damaged straw of other kinds, its use seems to be practical in many cases, though not in all.

We have grown a great abundance of material for an initial mulch by using rye between the rows of 5-year-old trees. This is followed by a more or less permanent cover of white and red clover, supplemented with hairy vetch. The latter plants are used to maintain the mulch until driven out by grass or less desirable forms, whereupon the interspaces may be re-tilled and reseeded to leguminous plants.

As compared with the other treatments in these experiments, it will be noted that the mulched trees are usually retaining their superiority in everything but color of fruit. Their margin is considerably smaller, however, than that in the recently planted orchards discussed earlier, and in a few cases it disappears entirely in favor of some of the tillage treatments. The latter cases are found chiefly in the heavy soil of Experiment

218, which is rather unexpected because this soil is almost the same as that in our Experiments 331 and 333 above, in which the mulch has proved very satisfactory.

Incidentally it may be noted that thus far the tillage and cover-crop treatment has surpassed the mulch in but a single average and that is the rather surprising one of color when used in connection with manure. In a few other individual cases, especially in Experiment 218, the cover crops have also excelled slightly in certain other characters. In general, however, with the exception of Experiment 218, the mulch treatment has proved very satisfactory for orchards of the early bearing age, when the cost of materials is not too high.

#### THE VALUE OF COVER CROPS.

Just as in the very young orchards considered above, cover crops here again have largely failed to come up to expectations. In yield, as compared with tillage alone, they have shown a couple of 25-bushel increases,—both in Experiment 217. In practically all other cases, however, their gains either have been very small or totally lacking, with the results favoring the other treatments.

These results again may be connected with local conditions, to some extent, and also with the unsteadiness and youth of the trees, though the exact importance of these influences is not at all certain. In two of the older orchards, particularly in Experiments 221 and 338, the benefits from tillage and cover crops together have seemed to be quite important,—amounting to about 122 bushels per acre annually as compared with sod in the latter case. Just how much of this is due to the cover crop, however, can not be determined from the particular combinations that are under comparison in those experiments.

On the other hand, the present series do contain comparisons bearing directly on the value of cover crops; they give the average annual returns for 5 years from three experiments on three markedly different soil types, and their results are certainly not without significance. These results indicate that many orchards, and especially those in the early stages of bearing, are not likely to be materially benefited by the addition of cover crops. Where the humus is very deficient, however, and per-



haps in older and more mature orchards, cover crops may be expected to give better results.

Other matters, such as the relation of cultural methods to fertilizer response or utilization, the influence of fertilization in reducing the differences between the various cultural methods, the relative value of manure and of our commercial fertilizer in connection with the different treatments, and something of the relation between soil type and the response to all these treatments, might also be considered here if space permitted. They can be determined fairly well by examining the tables themselves, however, and some of them will be referred to briefly in connection with certain results that appear later.

#### RESULTS FROM MATURE ORCHARDS.

One of the following orchards can hardly be considered mature, since it is now only 10 years of age, but it is considered in Table IX along with the 24-year-old trees of Experiment 338 because the experiments are of the same type and they thus admit of briefer treatment. These two experiments, 336 and 338, are what we have called "combination experiments" because they involve two distinct series of questions,—one on fertilizers and the other on cultural methods. Only the latter series is considered in Table IX, and the treatments correspond with Nos. IV, VII and X of the general plan shown in Figure 1. No fertilization has been used on the present plats except once (in 1911), when a commercial fertilizer analyzing about 6-10-6 was applied uniformly over all the treatments at the rate of about 600 pounds per acre. The results from these two experiments on the four characters of yield, growth, size and color, are as follows:

TABLE IX.—INFLUENCE OF CULTURAL METHODS ON YIELD, GROWTH, SIZE AND COLOR IN APPLES.

(Annual yield per acre and total growth increases, 1908-12, and average size and color, 1909-12.)

	Expt. 336.	Expt. 338.	Total yields.	Yield increase over sod.	Inc. in tree girth.	Growth increase over sod.
	Bushels.	Bushels.	Bushels.	Per cent.	Inches.	Per cent.
Cover crop.....	47.8	312.9	1142.0	72.5	8.33	41.4
Mulch.....	57.0	266.4	1030.2	55.6	7.30	23.9
Sod.....	23.1	190.2	662.4	-	5.89	-

	Average size in 336.	Average size in 338.	Average size.	Size increase over sod.	Average color.	Color increase over tillage.
	Ounces.	Ounces.	Ounces.	Per cent.	Per cent.	Per cent.
Cover crop.....	6.77	4.24	5.50	12.0	62.0	-
Mulch.....	6.48	4.06	5.27	7.3	69.9	12.7
Sod.....	6.01	3.82	4.91	-	74.4	20.0

These results show greater benefits from the tillage and cover-crop treatment than any of the experiments thus far considered. In every character except color, this treatment here shows very decided gains over sod alone, and with one additional exception it is also surpassing the mulch by considerable margins. In these cases, as compared with sod, the cover-crop trees are making 41% better growth and are showing 72% better yields, which amounts in the latter case to more than 122 bushels per acre annually in Experiment 338. The fruit also is 12% larger. As against this, the sod fruit is 20% higher in color. The superiorities and deficiencies of the sod in comparison with the mulched trees are similar, but with smaller differences, and as usual, in the younger orchard, the mulched trees are again showing the highest yields of any treatment by about 10 bushels per acre annually.

These results are likely to be considered much more "orthodox" than those in the three earlier experiments, because they are more nearly in line with most of the current opinion. The other results are more extensive, however, and are just as truly the responses of the trees involved. It is evident, therefore, that

the success or failure of the various cultural methods is also closely dependent upon local conditions, just as already found to hold true with fertilization.

As already noted also, it is not practicable in the present cases to determine just how much of the credit is due to the cover crops and how much to the tillage. But in view of the rather unfavorable results from cover crops in the direct comparisons above, the present benefits can hardly be largely or positively credited to them without more definite evidence.

#### RELATIVE COMMERCIAL QUALITY OF THE FRUIT.

Assuming that commercial quality in apples is largely determined by the size and color of the fruit, it would seem to be almost a triple tie for the leading place between the various treatments here. This is on account of the fact that the gains in one character are usually offset by deficiencies in the other and vice versa. If there is any material advantage, it is probably with the mulch, since the size of its fruit appears to be satisfactory and its color is distinctly higher than that of the cover-crop fruit. On the same basis and assuming equal soundness and perfection, the mulched fruit in Experiments 217 to 219 would also doubtless be ranked first in commercial quality in about two-thirds of the cases, or in about six of the nine opportunities for comparison. Incidentally, the high average size generally shown by the mulched fruit, when the crops are not excessive, is clear evidence of the excellent moisture-conserving ability of a good mulch and this also has been thoroughly demonstrated experimentally.

Thorough and proper tillage will likewise conserve moisture very satisfactorily, but its action on the color of the fruit is quite similar to that of too much nitrogenous fertilizer,—the result in either case being a gray and unsightly color, instead of a rich red, which greatly detracts from its salable qualities. Other characters, however, such as full development in size and a normal period of ripening, are also very important in securing the best dessert and keeping qualities, and where the tilled fruit can excel distinctly in these respects it may often more than overcome its usual deficiencies in color. In this connection also, the relative keeping quality of the fruit is evidently of much importance and definite and extensive compari-

sons of average fruit from the different treatments are needed to determine their relative influences on this important character. As yet, however, the facilities have not been sufficient to get this accomplished.

#### RESULTS FROM THE FASSETT ORCHARD.

This orchard is fully mature, since its age, as shown in Table I, is now 40 years. Its results, therefore, should be typical of orchards in the fully mature class. Our experiment here was started in 1907, and the treatments involved are those numbered IV to IX in the general plan shown in Figure 1. The other treatments in this plan were omitted because of limitations in the experimental area available.

The results of the present treatments in respect to the four characters under consideration are shown in Tables X and XI. The yields are given for four years only, excluding the first two years instead of only the first one in this case, so as to allow the same number of full and off years to each treatment. This is desirable in the present experiment because of the marked alternations in bearing that have developed in some of the plats, with their full crops not all coming on the same years. The trees here are set at the rate of 27 to the acre.

TABLE X.—INFLUENCE OF CULTURAL METHODS ON YIELD AND GROWTH. EXPERIMENT 221.

(Annual yields per acre, 1909-12 and the average growths, 1907-12.)

TREATMENTS.	AVERAGE YIELDS, 4 YEARS.		GROWTH, 6 YEARS.	
	Tillage and cover crop.	Sod mulch.	Tillage and cover crop.	Sod mulch.
Without fertilization.....	Bushels. 345.9	Bushels. 322.8	Inches. 5.39	Inches. 3.19
Gain over mulch.....	23.1	-	2.20	-
Relative gain.....	7.2%	-	69.00%	-
Rank.....	1	2	1	2
With manure.....	382.5	513.5	6.72	4.26
Gain over lowest.....	-	131.0	2.46	-
Relative gain.....	-	34.2%	57.70%	-
Rank.....	2	1	1	2
With fertilizer.....	372.5	438.9	6.06	4.16
Gain over lowest.....	-	66.4	1.90	-
Relative gain.....	-	17.8%	45.60%	-
Rank.....	2	1	1	2

TABLE XI.—INFLUENCE OF CULTURAL METHODS ON SIZE AND COLOR.  
EXPERIMENT 221.

(Average weights and color of fruit, 1907-12.)

EXPERIMENT 221.		AVERAGE SIZE.		AVERAGE COLOR.	
TREATMENTS.		Tillage and cover crop.	Sod mulch.	Tillage and cover crop.	Sod mulch.
Without fertilization.....	4.79 oz.	5.22 oz.	Per cent. 68.0	Per cent. 79.9	
Gain over cover crop alone....	-	9.0 %	-	11.9	
Rank.....	2	1	2	1	
With manure.....	5.45 oz.	5.33 oz.	65.9	72.6	
Gain over cover crop alone....	13.8 %	11.3 %	-2.1	4.6	
Rank.....	1	2	2	1	
With fertilizer.....	5.16 oz.	5.37 oz.	68.9	73.1	
Gain over cover crop alone....	7.7 %	12.1 %	0.9	7.5	
Rank.....	2	1	2	1	

Taken as a whole, these results show a rather marked distribution of the honors,—neither method showing a uniform superiority over the other in all characters. The mulched fruit as usual is superior in color. It is also leading in average size, in two cases out of three, and its deficiency in the third is so slight that its general superiority in color would probably entitle it to rank first throughout in respect to commercial quality.

On the other hand, we find that here, as in the other mature orchard, the trees receiving the tillage and cover-crop treatment are making uniformly the largest growth. Whether or not this is also the best growth for trees of this age is less certain. There are some indications that the two plats receiving fertilization in addition to tillage and cover crops, are now making rather too much growth for best results in yield, which is naturally the important item in a mature orchard, and in it unnecessary growth is objectionable.

In the absence of fertilization, the cover-cropped trees are now excelling the mulch in yield by about 23 bushels annually, and this margin would be materially increased if the yields for the entire period were included. This superiority is very decidedly reversed, however, when fertilization is added to both treatments. Under the latter condition, the mulched trees are giving better annual returns than any combination involving tillage and cover crops that we have tested thus far. Their



yields also, have been much steadier than those of the other treatments, as shown in the following table, which gives the annual yields from 1907 to 1912, in bushels per plat of about an acre.

TABLE XII.—INFLUENCE OF CULTURAL METHODS, WITH AND WITHOUT FERTILIZATION, ON STEADINESS OF YIELD.

(Yields in bushels per acre annually, in Experiment 221.)

TREATMENT.	1907.	1908.	1909.	1910.	1911.	1912.	Average last 4 years.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Mulch and manure..	84	215	493	526	621	413	513.5
Cover crop & manure	117	145	493	216	612	188	382.5
Mulch & fertilizer..	38	199	409	560	370	416	438.9
Cover crop and fertilizer.....	129	122	639	118	573	161	372.5
Cover crop alone...	23	467	195	505	202	481	345.9
Mulch alone.....	29	221	215	391	246	439	322.8

In the presence of fertilization in this orchard the differences in steadiness of yield between the mulched and tilled trees are very striking. The tilled trees on the one hand are showing a regular and distinct off year, while those receiving the mulch have shown steady increases in yield up to about 600 bushels per acre, which is followed by a decrease of only about 200 bushels. The off year, therefore, has not yet been eliminated entirely, but its influence has been greatly reduced. At the present time, the average deficit on the tilled and fertilized trees in this experiment is practically represented by the losses in their off years.

The fundamental cause of this difference is very important. Practically it appears that the chief difference in treatment lies in the fact that the tree roots are materially disturbed in one case and not in the other. Strange to say, this disturbance does not seem to have injured the growth, but it, or some other influence not yet recognized, has evidently reduced the yields very materially. The harmful effect on yield that regularly accompanies too much pruning of the tops of apple trees is now widely recognized. There is therefore reason to believe that similarly harmful effects may be associated with any regular and material pruning of the roots.

These and other relatively unfavorable results with the ordinary methods of orchard tillage suggest the advisability of shallower plowing over tree roots,—not deeper than four inches at the most,—and where the conditions permit, it would seem advisable to displace the plow entirely, either with a double-action disc or cutaway harrow, or with a satisfactory mulch.

IS FERTILIZATION MOST EFFECTIVE ON TILLED OR UNTILLED TREES?

Judging from the Fassett experiment alone, one would answer this question positively in favor of the latter trees. In Table X, for example, the addition of manure to the tillage and cover-crop treatment has resulted in a gain of only 37.6 bushels per acre, while the corresponding gain from its addition to the mulch is 190.7 bushels or over 5 times the gain secured by manuring the tilled trees. With the commercial fertilizer similarly, the gains from its use on the tilled trees are but 27.6 bushels annually, while the corresponding gains are 116.1 bushels on those receiving the mulch. These cases are, therefore, evidently on the side of greater efficiency from the fertilization applied to untilled trees, and incidentally it may be noted that the thinner mulch under these larger trees shows none of the interference with fertilization noted above in the experiments of Table V.

Similar inference may be drawn from the large benefits obtained from fertilization in our untilled fertilizer experiments in the Johnston and Brown orchards,\* as compared with the smaller benefits obtained in other similar experiments involving tillage. Such comparisons, however, are naturally much less direct and less exact than those in the Fassett orchard.

In Table V, on the other hand, with the exception of manure on sod, we find that the largest increases in yield have regularly come from the fertilization applied in connection with tillage, and the differences are especially marked in Experiments 217 and 218. In Table VI, similar results are apparent in regard to growth,—the most striking gains from fertilization in this

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\* The fertilizer experiments in these orchards are discussed in the paper preceding.

case being shown by the tilled trees of Experiment 219. The benefits from fertilization, therefore, are by no means confined to untilled trees, and in some cases its utilization is evidently better when accompanied by some cultivation.

The exact conditions associated with these different kinds of response have not yet been determined, and this is one of the important questions intended for further study, by chemical and physical means, as soon as the necessary facilities are available.

#### THE RELATIVE IMPORTANCE OF FERTILIZATION AND CULTURAL METHODS.

Throughout these experiments, and especially in the older orchards, the importance of fertilization has been quite apparent. In most of the results from Table V on, it will be observed that the addition of fertilization, either in manure or in commercial form, has largely overcome or neutralized the differences developed by the various cultural methods when used alone. In some cases, also, it has even distinctly reversed the latter differences. Similar, though not exactly analogous data, bearing on the same general question, may be obtained from the Johnston experiment by comparing the yields produced on its cultural-method plats with those obtained on certain of its plats receiving fertilization.

The figures resulting from this comparison are shown in Table XIII. As already noted in connection with Table IX, the cultural-method plats in this experiment have received one uniform application of fertilizer, the application being made in 1911. This has not yet influenced the yields very materially, with the possible exception of the mulched trees in 1912, but the annual differences for the three preceding years are also given, thus permitting any further comparison that may be desired. The sod here is not especially heavy, owing to the practically complete occupation of the ground by the trees.

TABLE XIII.—RELATIVE INFLUENCE OF CULTURAL METHODS AND FERTILIZATION ON YIELD.

(Annual yield per acre, during four years, 1909-12, in Experiment 338.)

TREATMENT.	Annual yields per acre.	Annual gain over sod.	Annual gain 3 years.
	Bushels.	Bushels.	Bushels.
Sod.....	190.2	—	—
Sod mulch.....	266.4	76.2	22.
Tillage and cover crop.....	312.9	122.7	100.
Sod plus phosphate and potash.....	277.6	87.4	123.
Sod plus nitrogen and phosphate.....	542.0	351.8	451.
Sod plus manure.....	637.0	446.8	390.

In the present table, it will be noted that sod alone has given a four-year average yield of 190 bushels per acre. The addition of the mulch has raised this average by 76 bushels, and the substitution of tillage and cover crops has raised it still further to a gain of nearly 123 bushels per acre, which is the maximum gain obtained thus far in our experiments, from the latter treatment.

In the latter half of the table, however, we find that the addition of phosphate and potash to sod, without any cultivation, has resulted in an average gain of 87 bushels per acre, while the addition of nitrogen and phosphates has given an increase of about 352 bushels, and manure now shows the enormous gain over sod alone of more than 446 bushels per acre annually. These latter increases are thus about 3 or 4 times as great as the best of those obtained from modifications in cultural methods alone.

These and other results already given indicate that in many cases the character of the fertilization is of greater importance than the particular cultural method followed. This is not always true, however, and before doing any extensive fertilizing of orchards, a preliminary local test on the general plan described in the accompanying report on this subject is always recommended. Similarly, before making any radical changes in a cultural method, it is always advisable to give the proposed change a careful trial on a typical portion of the orchard, unless one already has undoubted evidence of the value of the change for his particular conditions.



## SUMMARY.

*(a) Experiments in Orchards Recently Planted.*

(1) In this group of experiments the untilled and mulched apple trees have uniformly made a better growth during their first five years than any of the trees receiving the usual orchard tillage and cover crops. These results are similar to those reported from the Ohio Station, in their Bulletin 171, page 207.

(2) As compared with clean tillage alone,—followed by weeds or other natural growth,—the addition of cover crops has not yet resulted in any material gain. In certain cases, they have even appeared to check the growth of the trees somewhat. These and the results immediately following are similar to those reported from the Nebraska Station in their Bulletins 79 and 92.

(3) The addition of vegetables or other tilled intercrops, when accompanied by proper fertilization, has not materially reduced the growth of the trees, as compared with other tillage methods. In one case the accompanying growth was slightly better than that of the adjacent trees receiving tillage and the usual midsummer cover crops.

(4) Considerable variation has appeared in the value of cover crops, as measured by their effects on tree growth. Thus far, hairy vetch and crimson clover have proved best among the leguminous covers, and millet, rape and buckwheat have been best among the non-leguminous. Their influence on the moisture supply, in both fall and spring, often seems to be more important than their relations to humus and plant food.

(5) Alfalfa for five years has proved very effective as a mulch producer and as a permanent orchard cover, when its growth is prevented from competing directly with the tree roots. The exact effects of the latter competition and the relative values of alfalfa and certain other plants as permanent orchard covers have not yet been fully determined.

(6) In general, moisture conservation appears to be more important than applications of plant food in the case of young trees, though the latter may also be of value sometimes. For this reason, a good mulch of strawy manure, wherever available, is likely to be one of the best possible treatments for stimulating growth and vigor in trees of this class.



(b) *Experiments in Orchards of Early Bearing Age.*

The results in this group of experiments are somewhat less clear and less uniform in their trend than those in the other orchards. In general, however, the following points have been fairly well demonstrated:

(7) In the group of early-bearing or "adolescent" orchards, the treatment involving sod alone has resulted uniformly in the least growth and the most highly colored fruit of any of the treatments. It also has usually exerted some stimulating influence on the yields. The latter effect is apparently secured primarily as a result of mild injury while the former is probably chiefly due to the hastening of maturity. The growth of grass directly over tree roots is usually objectionable because it offers an undesirable competition for soil nitrates and moisture.

(8) This competition can be satisfactorily eliminated by means of a good mulch,—one involving about three tons of vegetation per acre annually, or once in two or three years on the younger trees. The addition of such a mulch to the ordinary sod treatment has increased the average yields by about 20 to 35 bushels per acre annually in the younger orchards, and it has given a maximum annual gain of 76 bushels in one of the older orchards.

(9) Assuming that the above gains represent the approximate crop value of a three-ton mulch, it is evident that relatively cheap materials must be available, if the mulch is to show a definite profit. A rye cover crop grown between the rows will usually give a very satisfactory initial mulch around the trees, and this can then be maintained for a considerable period by growing leguminous or other less active permanent covers in the unmulched areas.

(10) In the "adolescent" orchards, the addition of fertilization, with manure especially, has generally resulted in smaller increases on the mulched areas than on the other treatments. This condition is reversed in the older orchards, however, thus indicating that the apparent interference in the younger orchards may be due to too thick a mulch. In general the mulch treatment has compared very favorably with the other treatments in nearly every point considered, but ample protection against mice must be provided, wherever this treatment is used.

(11) In the present group of orchards, tillage alone and also tillage with leguminous cover crops have usually been surpassed by the mulch treatment, though in one experiment they have excelled in most respects. The addition of cover crops here also has not yet shown any material gain over plain tillage followed by weeds or other natural growth. These results may not apply generally, and cover crops may often be expected to show a profit in more mature orchards or in soils that are especially deficient in humus, but thus far they have shown no important crop value in the present experiments.

(c) *Experiments in Mature Orchards.*

(12) In most of the experiments in the more mature orchards, the tillage and cover-crop treatment has proved better than the other methods of soil management, in respect to yield, growth and average size of fruit. Its chief deficiency has been in color of fruit, in which it has been regularly surpassed by the other treatments. It is impracticable from the comparisons available, however, to determine how much of the present benefits are due to tillage and how much to the cover crops.

(13) On the assumption that the relative commercial quality of the fruit is determined chiefly by its average size and color, it appears that the mulched fruit generally ranks highest in this character, with that on the cover crops usually following closely. Full development in size, as well as a normal period of ripening, is also of much importance, especially in securing the best dessert and keeping qualities. Where the tilled fruit can show material advantages in these respects, it may often more than compensate for its customary deficiencies in color.

(14) In the fully matured orchards, the tillage and cover-crop treatment alone has proved superior to sod mulch alone in yield and growth. When fertilization is added to both treatments, however, the situation is reversed as to yield, and probably also as to growth, although the *larger* growth is occurring on the tilled trees. The latter is rated lower because too much growth is undesirable in trees that are fully mature.

(15) In the Fassett orchard especially, the yields on the mulched and fertilized trees have been much *steadier* than those under any other treatment. The results on these plats show a

practical elimination of the off year during a period of five years. The chief difference in treatment between these trees and those receiving tillage, cover crops and fertilization, seems to consist in the fact that the roots are regularly and materially disturbed in the latter case and not in the former. This suggests the general advisability of shallower tillage over tree roots, with the possible displacement of the plow entirely wherever soil conditions will permit.

(16) In these experiments, fertilization has often proved more efficient on untilled trees than on those receiving tillage. There are some notable exceptions to this, however, especially in Experiments 217 and 219. The benefits from fertilization, therefore, are evidently not confined to untilled trees and in some cases the applications are evidently utilized better when accompanied by some cultivation. The exact conditions associated with these different responses have not yet been determined.

(17) In the majority of cases, in these experiments the addition of fertilization has largely neutralized the differences shown by the various cultural methods when used alone. In some cases also it has even reversed the cultural differences. These and other results indicate that proper fertilization is often more important than the cultural method. No important change in local practice should be made, however, until one has clear evidence of the value of the change for the particular conditions involved.

Question. What did you use for the intercrop?

Prof. Stewart: Corn, potatoes, mangel wurzels, peas and beans.

Ques. Then you put a cover crop in afterwards?

Prof. Stewart: Yes, the difference is, this cover crop is seeded quite late, usually along in September, so that its moisture draft is less, and it has been usually a mixture of crimson and red clover; that is, a leguminous cover crop.

Ques. Did you use any phosphate with the intercrop?

Prof. Stewart: We fertilized for the intercrop to a certain extent, just a moderate fertilizer for the crop.

Ques. What kind of soil is that which the experiment is on?

Prof. Stewart: It is a rather heavy limestone clay loam. It is one of those limestone soils in which you would have to go a

good many feet to get a well, so that the water table is quite low. It is excellently drained.

Ques. May I ask, Do you maintain the clean tillage during the entire season?

Prof. Stewart: This clean tillage is stopped in the middle or latter part of July, just as the tillage is stopped on the plats receiving cover crops, so that the difference will essentially be that in one case we have merely the natural growth, weeds, and so on, following the cessation of tillage, and in the other case we have a definite cover crop.

Ques. What I learn from this mulch system on your land is that the trees respond to it better than they do to tillage, and that more moisture is conserved by the mulch than by the tillage?

Prof. Stewart: Yes, there isn't the slightest doubt about that point, because we made the moisture determinations this fall very carefully and thoroughly and under almost ideal conditions. We took them about the 10th of September, after one of the most severe drought periods that we have experienced in recent years. It was a severe test on the different cultural methods. It was, however, a comparison of the moisture conditions about six weeks, or even eight weeks, after the tillage had stopped, you understand. In other words, we compared the moisture conditions on the tilled plats at the close of the active season with the moisture conditions under the mulch treatment at the same time. We found that the moisture content under all of the tillage systems ran from about five to eight per cent of moisture in the surface foot of soil. It was almost dust dry. In other words, it contained about five to eight per cent of moisture, but trees can hardly extract moisture from soil below seven or eight per cent, so that most of those trees were existing in a state practically of complete drought. At the very same time we found that under the mulch there was 17 to 18 per cent of moisture. The soil was quite moist to the touch. The optimum, or the best moisture content possible in that soil is 20%. We had 17 to 18%. This means that even at the end of a very trying period we had 85 to 90% of the best possible moisture content surrounding the roots of the mulched trees, while those under tillage were practically in a state of drought.



Ques. How large a surface does your mulch cover?

Prof. Stewart: We attempt to keep it out over the majority of the root area—moving it out as the roots extend.

Ques. Will you tell us again in detail how that mulch is applied and how expensive it is?

Prof. Stewart: In a bearing orchard we attempt to apply about three tons of vegetation annually, to maintain the mulch, besides what is grown naturally in the orchard. Now in some cases that amount of mulch is out of the question, as you simply cannot obtain that amount of vegetation. But any kind of vegetation will do. We use buckwheat straw, swamp hay and any kind of damaged straw we can get hold of. You might use potato tops, or anything of that general sort, or you might grow a lot of mulching material by the use of some of the coarser millets, on relatively moist land that would be of little use for anything else.

Ques. What was the condition of the fertility before the operation?

Prof. Stewart: Well, it was rather poor in this field. The fertility in this soil was quite low. So we expected the addition of fertilization would be of value, but as a matter of fact it was much overshadowed in importance by the moisture. Moisture is of much more importance to young trees than the addition of plant food.

Remark: The tree needs its moisture in the growing season, and probably that cultivated plot had lots of moisture while the cultivation was going on. In September the growing of the apple tree is done. What little growth it makes then is the ripening up of fruit buds.

Prof. Stewart: Yes, but the point was this,—that the growth of the tilled trees has been regularly checked much earlier in the season than the growth of the mulched trees, with the net result that the latter trees are now a fourth to a third larger. In your climate you might have to lighten up the mulch or do something else that would be different, though it is usually the dry tree that is injured by winter, rather than the one that is plentifully supplied with moisture. We want our young trees to continue growing. We want to get a tree in as few years as possible that will be ready to bear fruit. We don't want to get



but a half season's growth when we might let it grow the full season.

Remark: In our country where we fertilize very heavily, when the severe winter comes we get lots of winter-killing among the young trees, the bark bursting and the trees dying back. It is not a safe thing at all in Nova Scotia to keep up a late growth.

Prof. Stewart: In that case of course you will have to modify conditions to meet it.

Ques. Are the winters severe in Pennsylvania?

Prof. Stewart: We have had some pretty cold weather there in some instances. Year before last we had weather that ran as low, according to the reports, as 30 below. The actual fact is simply that we had 20 or a little more below zero. But the point is this,—that cold came along in February after we had had a very good preparatory season for the trees to stand it. The suddenness of the coming of the cold makes much more difference than its actual extent. But I will say that we have not had an appreciable bit of winter injury on any of our trees and they are growing in different parts of the state, too.

Mr. Keyser: You get more freezing and thawing than we do?

Prof. Stewart: Yes; last winter there was a certain amount of winter-killing in the state, but we didn't get any on any of our different experiments; it was to that relatively rapid freezing and thawing that I attributed the winter-killing last year, especially of peach trees.

Mr. Morse: What should you say was the average twig growth of those young trees?

Prof. Stewart: Well, we have had as much as three feet twig growth on them this past season, for example. The point is that we can get more growth in a given season, we can conserve moisture better, with certain other methods than we can with tillage, and when you pile those seasons up, one after another, we have bigger trees because of that better moisture conservation.

Mr. Morse: There is no trouble in getting the bigger trees; the trouble is getting them without the winter-killing to pay for that.

Prof. Stewart: In that case you may have to lighten the mulch, or possibly eliminate it entirely.

Ques. I would like to ask if this experiment has been running long enough so that you know the effect on the fruit?

Prof. Stewart: No; this is only the first five years of the growth. We now have six years' results, but we have not the sixth year tabulated yet.

Ques. I understand that you are using alfalfa as a permanent cover crop, using the same crop year after year?

Prof. Stewart: Yes; it is a permanent cover.

Ques. That gives you a heavy mulch?

Prof. Stewart: Yes; we have plenty of mulch. But as the trees grow larger of course this mulch increases in size and the mulch producing area decreases, and there will come a time when it will hardly maintain a satisfactory mulch, and I don't know what is going to happen when these trees reach the bearing stage. If you cannot grow alfalfa you will have to grow some other crop as a permanent cover and use the same principle. You don't have to use the same plant. Alfalfa is a detail. Vetch is second with us. The first cover crop is alfalfa. The vetch, however, is an annual cover; it is the best of them, and I am just now trying vetch and red clover and white clover combined, as an experimental permanent cover, using that triple combination in the same way that I am using the alfalfa below. It is my opinion that the development of the proper plants and the proper handling of permanent covers in an orchard right now is of much more importance than the consideration of annual covers and annual tillage. In other words, if I could say at the present minute what is the best combination for a permanent cover in an orchard to be used as the source of a mulch to place around the trees, why I would be very well satisfied. We are working now on the permanent covers. This alfalfa is a single instance of a permanent cover. I want others.

Ques. Is there anything else that could be a permanent cover except the alsike?

Prof. Stewart: Well, the alsike is not a good plant for this reason: It is a smooth leafed or globose plant and all such plants are severe in their moisture draught. You want a hairy-leafed plant like the hairy vetch. Its moisture draught is ex-

tremely low. As a matter of fact the hairy vetch is an ideal cover for an orchard. The soil under the vetch will often be almost too wet to plow, when under alsike, right beside it, it will be in a dry condition. We have plowed crosswise and otherwise to see. The difference was so great that you could show the sharp break on a photograph. Alsike and rye are both severe in their moisture draught, and that is what you don't want as a cover in an orchard. The advantages of the vetch are a slight moisture draught, a sprawling habit of growth so that it covers the ground and checks evaporation from the soil, and the fact that it is a nitrogen gatherer. You have got everything in that plant, but with this defect, that it frequently winter-kills with us. I believe if you have a sprinkling of rye in combination with the vetch that it will winter-kill much less than if you attempt to grow the vetch alone. We are growing it alone in the present experiment because we want to see what its effect is.

Ques. Are these crops all used alike as a mulch?

Prof. Stewart: The alfalfa is the only one used as a mulch. These others are tilled and seeded at the proper season of the year. The cow peas and the soy beans are slight in their influence on tree growth. They grow a beautiful cover crop if we look at them from the view point of the crop. The plants look fine. But in their influence on the tree they are way down in rank. The reason for that I figure as this: These two plants have to be sown early, about the 25th of June, so that the tillage season is short. They then come up and begin drawing moisture from the soil, thus checking the growth of the trees, with the result that the trees on those plots are considerably smaller than those in the other cases. I think it is because of their vigorous growth, coupled with the fact that we have to sow the seed so early, that they don't give us the effects that we expect.

If a person attempts to use a permanent cover it does not mean that he should exclude tillage entirely. He is not absolutely confined to excluding tillage from an orchard, and if he finds, for example, that he can get along better by putting the disc or something into his orchard along in mid season to stir things up and get a new start for his cover, why so much the better. I know one man in Virginia who is maintaining vetch as a permanent cover. He simply lets it grow along until mid

season, until a satisfactory amount of seed has developed on the plant, and then he puts in a disc and discs that seed down into the ground, and thus gets his re-seeding. That is all he does and he is getting along very well with it. We have not been able to work it just that way yet. We have not tried it. It may work all right.

Ques. What kind of millet did you use?

Prof. Stewart: This was the German millet. The Hungarian is a little bit larger and longer in its season of growth, but it doesn't make so very much difference. The millet did very well, you will notice. From the view point of the tree itself we have been throwing out some of these cover crops because logic indicated that they were not as good as some others. In other words, we have discarded some plants because they were not nitrogen gatherers and here are nitrogen gatherers that are way down, while millet, a non-nitrogen gatherer, is way up in its influence on the tree.

Ques. Does millet absorb a great amount of moisture?

Prof. Stewart: Apparently not. The moisture draught is not nearly so high as it is in some plants, and there is this about millet,—it stands up erect in the fall and catches the snow winters, thus accumulating a certain amount of moisture, and there is no growth in the spring to furnish any possible moisture competition with the tree at that time.

Ques. In using any of those cover crops, do you recommend continuing the tillage as long as possible, up to the first or the middle of July, before you seed, or would you seed fairly early?

Prof. Stewart: I would continue my cultivation at least to the middle of July before I seeded the majority of my cover crops. I don't know just what you would have to do.

Remark: The point was this: If you seed early you get a growth for mulch.

Prof. Stewart: Well, I wouldn't want that, for the reason that in a case of that sort you would be growing your millet vigorously at a time that the trees needed the moisture very badly themselves. I would want a mulch around those trees at the very time you are growing these plants to get a mulch.

Ques. What was the difference in that experiment No. 218? The mulch effect is less.



Prof. Stewart: Well, that is a heavy soil. It is exactly the same soil type that I was showing you in our young orchards, but it is in quite a different part of the state. That soil type in the southern part of the state seems to show quite an advantage for tillage. It is a heavy soil and on trees of this age tillage has been better uniformly in that heavy soil in the southern part of the state but in the same soil type at the College the mulch has been better for young trees.

Ques. What is the effect on the color of your fruit in these different methods?

Prof. Stewart: We always get our best color on sod, our next best on the mulch, perhaps third on tillage and cover crops and fourth, frequently on tillage alone.

Ques. Do you consider it would be safe to discontinue that mulch system that you have been running five years?

Prof. Stewart: Why, if I needed to discontinue it I certainly would do it, and the way I would discontinue it would be to go in there with a double-action disc or cutaway harrow, and I would simply cut things up at any time I cared to. I feel perfectly free to go in with a disc or cutaway harrow and tear up the soil, sod, or anything, no matter how long the mulch has been running. There is quite an erroneous impression about the relation of cultural methods to the position of roots of apple trees. As a matter of fact you cannot change the position of apple roots in the soil to any great extent by cultural methods. Apple roots have a certain zone that they are adapted to follow in a soil, and they do not go down nearly so deep under any system as many people think. We studied the depth of apple roots on eight or nine different soil types and quite a good many trees, and we found that in all cases by far the majority of the feeding roots were in the surface 12 inches of soil, regardless of the cultural method, regardless of the soil type and regardless of the tree variety. In the case of the mulch system that entire 12 inches is completely filled with roots. In the case of the tillage system, it is only the lower eight or perhaps the lower six of that 12 inches that are entirely filled with roots, and in the upper four to six inches the roots are annually cut out. Now of course, if a person goes into an orchard after it has been running for a certain time without tillage he will have to do a



tremendous amount of cutting, but he will still have left practically as many roots below as you normally have under the cultural system.

Ques. You would not want to return to permanent sod?

Prof. Stewart: I would not want to return to a permanent sod unless I knew I could get satisfactory results with fertilization, because sod alone as a general proposition is the worst.

Ques. We are just being taught that we should use dynamite for setting trees. What is the advantage if the tree roots run only about 12 inches deep?

Prof. Stewart: We have run three experiments in dynamiting for two years and we have had no appreciable gain from the dynamited trees. I don't want to be misunderstood in all this at all. It may be the right thing here, but I will simply say that in our experiments in two different parts of the state, and one of them on a hard pan subsoil, where dynamiting should do good if at all, for two years on two orchards in that kind of soil and the third one in another sort—young orchards—we have had no appreciable gain, and also on some mature orchards we have had no appreciable benefit from it. I realize that over in New Jersey, Mr. Farley has recently reported dynamiting, in which he obtained some benefit, in the case of peaches. But we have had none and I doubt very much whether you will get a great deal of benefit from the use of dynamite in planting trees. Now that is my opinion. Mr. Farley's experience with peaches seems to be different. But the trees that were planted in comparatively small holes and the trees solidly tramped in are the best trees in our orchard. We don't need especially large holes for them. The roots get around somehow. And furthermore, in Missouri, some 15 years ago, from the experiments in which they tried out subsoiling with special plows and tore up the subsoil at a great expense and planted blocks of trees on that subsoiled area they found no benefit whatever.

Ques. I think a professor here told me of roots that went 17 feet into the soil. Where is that?

Prof. Stewart: We traced apple roots for 46 feet, but they ran out sideways. In certain arid districts, such as New Mexico and Arizona, the roots have to go down in search of water and some unusual depths are reported there.

Ques. How about alfalfa?

Prof. Stewart: It goes down pretty well.

Prof. Wolff: We in New Hampshire, like you, have had some discussions on this question of dynamite. The New Hampshire Experiment Station has one orchard in Manchester, in which I supervised the planting, and where dynamite was used, and for my part, in our state across the border, I have not been able to see any definite results from the use of dynamite.

Prof. Stewart: That corresponds exactly with our results.

Ques. Isn't that mulch of three tons per acre an immense amount?

Prof. Stewart: Yes, that is a pretty good mulch, but when the trees are rather large that is not a bit more than one needs. If you can't get that amount of mulch, get what you can and supplement it with proper fertilization. You can often add manure to plain sod and get a tremendous gain.

Ques. By sod, do you mean that you take the crop, whatever grows on the sod, away?

Prof. Stewart: In our experiments we take the first cutting away and the second cutting is left where it falls.

Ques. What is the market value of that mulch in your place?

Prof. Stewart: Well, it varies, of course. For our experiments we sometimes get baled straw at \$8 or \$10 a ton, but that would be impracticable for regular orchard operations.

Ques. How would sawdust do?

Prof. Stewart: I haven't tried it. I would be a little bit afraid to recommend it because of possible harm from its leachings.

Ques. You use three tons every five years on the young trees?

Prof. Stewart: No, we have used for those trees only a maximum of about 100 pounds for a tree and put it on about an average of every third year. In case of the alfalfa we have used no outside materials of any sort. We grow it between the trees. On other trees, we are now starting a mulch with a combination of rye and vetch that we grow between the tree rows and swing it around the trees as a mulch, and then we are going to carry it on by means of this white clover, red clover and vetch combination as a permanent cover.

Ques. You think if we have plenty of meadow hay that is not of much value, it would pay in rather a dry orchard to put it on?

Prof. Stewart: We have used swamp hay with excellent results; anything that will help hold the moisture. If you can get three tons of it you are not getting too much; and as the trees get larger you ought to have a little more to give a real good mulch around the roots.

Ques. Does that work well on old trees?

Prof. Stewart: Yes, especially in connection with proper fertilization.

Ques. You would advise to set an orchard in ground well prepared for a natural cover crop of couch?

Prof. Stewart: If the place were satisfactory for an orchard in other respects I would not hesitate to put it in orchard. The couch or quack grass would by no means keep me out.

Ques. What I mean, you would leave the grass right there?

Prof. Stewart: Yes. I would probably have to leave it, if it behaves in the usual fashion.

Ques. Does sod fruit have good keeping qualities?

Prof. Stewart: Yes, unless it hastens the maturity to such an extent that we have to pick apples too early in the fall.

Ques. How much manure do you use?

Prof. Stewart: Twelve tons to the acre, annually, but as I said yesterday, I don't now recommend more than eight tons.

Ques. What do you think of hogs in an orchard?

Prof. Stewart: Well, if I had the hogs and had no place else for them and wanted to continue raising them, I would leave them in the orchard. But we have had some very unfavorable results from hogs in an orchard. I would not have more than two or three hogs to the acre.

Ques. You would not run them late in the orchard?

Prof. Stewart: No, as a general proposition I would not.

Ques. If you were going to use commercial fertilizer and mulch would it be necessary to sift the fertilizer down with a fork?

Prof. Stewart: No; just sow it around over the surface and let the rains carry it down. As a general proposition you can get about as good results, sometimes better, by simply leaving

it on the surface and allowing the rains to carry it down as by tilling it in.

Mr. Morse: We have been taught strongly not to sow ground bone on the surface; that it will yield less benefit.

Prof. Stewart: It is possible that you lose the nitrogen there. At the same time there is not much nitrogen in ground bone and we are getting good results from dried blood left on the surface.

Ques. What do you mean by proper fertilization?

Prof. Stewart: I mean the fertilization that is adjusted to your orchard. Until it is adjusted the best guess that I can make is the general fertilizer that I showed you yesterday. My advice always is to take that general fertilizer, use it where you think your orchard needs it and then accompany it with a local testing plan in order to adjust the fertilization to your own orchard.

Ques. The young trees mulched show better results?

Prof. Stewart: Yes.

Ques. The older trees with the cover crops show better results?

Prof. Stewart: Yes.

Ques. Suppose we run our young trees on mulch five or ten years, how about changing that over?

Prof. Stewart: As I said before, we can do that if we go in with a double-action disc or something of that sort that does not injure the roots in the way the ordinary plow does.

Ques. What time of year would you apply the manure?

Prof. Stewart: It can be applied any time from late winter until the buds burst.

Ques. About this time?

Prof. Stewart: You can put the manure on now if it is in the way; but I think that the manure application from late winter, perhaps February, to budding out time is about right. This is for manure. But with a nitrogenous fertilizer, as I said yesterday, you don't want to put that on so early.

Ques. How about adding manure to the tillage and cover crops?

Prof. Stewart: We did that on those young orchards and also on the 36 year old orchard,—we added the manure to tillage and cover crop and didn't get nearly as big a gain as from

adding it to the mulch. That simply means that in an orchard that needs fertilization you can get greater gains from the proper fertilizer than from any other scheme. Now that does not apply to all orchards. There are some orchards in which a tillage system seems to be of more influence than the fertilization, and in young orchards, as I pointed out, uniform moisture conservation is of more importance than any type of fertilization. But the whole thing means that you must study your orchard and adjust to it the thing that fits it best. In some cases it will be a certain fertilizer. In other cases it may be proper method of conserving moisture, with a mulch if you can get it, and with proper tillage if you can get it.

Prof. Wolff: I notice yields of 542 bushels and 637 bushels. I feel sure there are not many that could come up anywhere near to that average. I believe, if I remember rightly, that the highest yielding acre in Massachusetts two years ago at the exhibit at the New England Fruit Show was about 220 barrels to the acre. That was said to be the highest yielding acre in Massachusetts. If we could do something like this we should be doing a big thing.

Prof. Stewart: Of course that 220 barrels may have been for just a single year, too. You see these are averages for four years. We have had yields running as high as 1300 bushels per acre in single years.

Dr. Twitchell: Isn't that due to the fact that your trees make much larger growth than ours?

Prof. Stewart: I suppose, undoubtedly, a good deal of it is, but it shows the possibilities. Incidentally, that 1300 bushels was grown on untilled trees receiving a nitrogen and phosphate application. Right alongside of them, on both sides, were the same varieties, same age of trees averaging 73 bushels at the same time, the only difference being that the 73 bushel trees were not fertilized; the 1300 bushel trees were—there was not even a mulch there, a proper fertilizer only.

Ques. I would like to inquire whether this was assorted fruit or the fruit as it run from the tree.

Prof. Stewart: These were the total yields.



COOPERATIVE FRUIT HANDLING ASSOCIATIONS  
OF THE PACIFIC COAST.

PROF. B. S. BROWN, Orono, Maine.

Coöperative fruit handling associations are in no wise a new, untried, or uncertain enterprise. While it is true that their span of successful operation may be included within the past 20 years, yet the success of such endeavors is measured by the volume of the business handled, and by the net cash returns to the coöperator. Many failures have resulted during the evolution of these organizations, but as much was to be expected. Everything was new and strange. No precedent existed to serve as a guide for the leaders. They were groping in the dark, as it were, yet feeling the insidious demands for a means whereby the fruit industry could be given a permanent financial standing. Prices were continually fluctuating, and uncertain. Buyers were compelled to be cautious, watching the movements of their opponents and competitors. No one dared order large quantities, for a fall in prices would mean the loss of months of careful business manipulation. Railroads had adopted the policy of charging "all the traffic could stand," and no one was in position to argue with them. Producers had no means of knowing what to ask for their fruit, and must rely upon the judgment and honesty of the commission men. Times were changing; laborers were asking more for their services; larger orchards were being planted; new sections were being developed, and this vast increase in production was being dumped into the centers of the population with no organization to handle it. Profits were on the decline; the pocket book was being affected. Growers drew together by instinct to talk the situation over, and coöperation was the result.

At first, progress was slow and many failures resulted. The organizations were either too small to make any impression upon the larger markets, or too large to act as a single unit. Farmers hesitated to pay large salaries to men with sufficient business acumen to handle the crop, and disorder followed. New laws had to be made and old ones changed. Railroad managers had to be interviewed and traffic agreements arranged for. Refrigerator cars, icing stations, and pre-cooling plants must be

provided. Fruit packages must be reviewed, sorted out, and systematized, to avoid confusion in the general market. Information bureaus must be established, that accurate data could be collected from all the fruit producing sections of the world. Selling agents must be placed in all the largest cities, to see that the fruit was properly cared for when it reached its destination. When all this was done, we had an organization, and one whose volume of business cannot be recorded in less than hundreds of millions of dollars.

Owing to various peculiar conditions, the Pacific Coast led off in the establishing of these coöperative associations, and now they have become a prominent part of the fruit growing industry. The volume of business aggregates 75% of the total output of the coast. One association alone in California does an amount of business twice that of the total aggregate of all the fruit interests of the six New England States.

The number of successful organizations is large. California has about 40; Colorado, 33; Washington, 18; Oregon, 12; Idaho, 4; New Mexico, 3; Montana, 1; British Columbia, 11; and Ontario, as long ago as 1896, had 24 in successful operation. The California Fruit Growers' Exchange is by far the largest, and handles a volume of business exceeding \$20,000,000 a year. The income of the state of California, from its varied industries, is about \$1,000,000 a day. Of this amount about 1-3, or one hundred and twenty million annually is represented by its fruit products, 25% of this amount being handled by the one exchange.

The California Fruit Growers' Exchange operates over the entire state, but confines its activities mainly to the citrus fruits. This industry is large, and in years of maximum production over 40,000 cars of oranges and lemons have been shipped out of the state. This means in round numbers fifteen million boxes, with a value of thirty million dollars. This vast business is handled by the exchange direct or through subsidiary exchanges which are allied with it.

All of the more successful organizations have been developed from the producer towards the manager rather than the reverse. Each locality that can get together ten or more interested growers forms a local association. These local bodies are further organized into a district group by sending one delegate from

each local society. The California Fruit Growers' Exchange now has over 80 local associations and 14 district organizations. The general office is located in Los Angeles, and is governed by a board of directors, composed of one delegate from each of these 14 district associations. They hire the manager and direct the general policy of the exchange.

They operate on such a large scale that they can maintain their own selling force. One or more salesmen are located in each of the largest cities of the east, who see to the selling of the crop and keep the general office informed on the conditions of the market. The daily consumption of each city is carefully tabulated, and a record kept of the supply distributed to smaller cities, tributary to the main centers. Each night during the busy season a telegram goes forward to the general office in Los Angeles, giving the sales for the day of the various eastern cities, the quantity received, and an estimate of the probable quantity that can be properly handled the following day. From this mass of telegrams the general office makes out a bulletin, and forwards a copy to each member of the exchange. By the middle of the afternoon each grower knows the condition of the eastern market for the previous day. From these reports the general office also forecasts the probable consumption for the next few days, and instructs each local association how much to pick or ship.

The average time consumed for a car of fruit to travel from California to New York is 14 days. This means that a car can be six days on its journey before its destination need be decided upon. The California Fruit Growers' Exchange has had as high as 500 cars of fruit rolling eastward without the destination of a single one being determined. The railroads offer a flat freight rate to all cities east of the Mississippi; hence cars may be diverted at any point without extra charges. As the cars near the eastern cities, the general office, by studying the reports of the telegrams, decides which city can best handle the arrival for the day, then wires diversion orders to the different agents. This means that the general manager must have at his finger tips, each morning, accurate information of the market conditions of each of the large cities, the quantity of fruit consumed each day, a forecast of the imports and the probable shipment of competing sections, the whereabouts of every car roll-

ing eastward, how much fruit is in the hands of each local association ready for shipment, and the quantity of fruit that will be ready to pick during the coming week. The manager does all this for \$1000 a month, and few envy him his job.

In order to maintain this standard of efficiency, the exchanges must guarantee their product. To do this they have had to supervise the picking and packing of the fruit. They have adopted standard packages, standard packs, standard grades, and even standard cars of loaded fruit. Every package is labelled with the variety of the fruit, the number of fruit in the package, and the number of the packer. On one end of the box is stamped the brand of the local association, and on the other the name of the exchange.

Each local association in the exchange is incorporated under the laws of the state. This binds the members together and permits legal restraint to prevent growers from withdrawing at critical times. Most exchanges are non-profit sharing corporations, the revenues being derived from a flat tax on each box or carton handled. The California Fruit Growers' Exchange charges 5 cents per box for oranges. The California Almond Growers' Exchange charges one cent per pound on almonds, the Cured Fruit Exchange, one-fourth cent per pound on raisins, prunes, etc. The surplus each season is pro-rated among the members, according to the quantity shipped.

As to what the exchanges have been able to do by way of increasing the net returns, the results will speak for themselves. In 1895, oranges were barely bringing the cost of picking and shipping, and many growers despaired of ever making the business pay again. In the 18 years since the reorganization of the exchange the business has developed rapidly from five million to over thirty million dollars. The cost of the orange boxes, and the picking, packing and selling of the fruit has been reduced to 35 cents per box against 80 cents before the time of the exchange.

The Almond Growers' Exchange started in 1911, and the prices were boosted the first year from 9 to 12 cents per pound to 12 to 16 cents; this in spite of the fact that the crop was the largest ever known. This increase in price added over \$200,000 to the net profit of the growers. This added income does not materially affect the price of the article to the consumer, the



\$200,000 being the result of speculation, and the profits to the middlemen.

In May, 1912, the Almond Growers' association sent out blanks to each member of the exchange, and collected data as to the probable amount of the crop to be harvested, varieties, etc. After these data were all tabulated the directors got together, and from the figures of previous years set a price at which they could offer the crop. Eastern brokers were advised of the price and the quantities offered, and were requested to bid for the amount wanted. The crop was estimated at 2000 tons, or 200 carloads. The next day after these letters reached the East, telegrams began coming in, making reservations, and by the second day the crop was all sold and some 30 carloads over; and this, fully six weeks before the first almond was harvested. This was possible because the buyers knew that the prices would not be changed and they were safe.

The Cured Fruit Exchange was organized last year. This was for the purpose of handling raisins, prunes, dried peaches, etc. For the preceding two years raisins had not returned the cost of production, and prunes were selling on a three and three and one-half cent basis—barely paying expenses. The organizer began incorporating local bodies in September of last year, with no thought of handling that crop, but by the first of January, 1913, over 400 carloads of fruit were tied up in nine local associations. Brokers discovered that dried fruit was getting scarce, and advanced the price one-fourth cent per pound. Soon another advance, in a few weeks another, and so on, until a full two cents a pound advance was reached. This amounts to \$40 a ton, and on 400 cars, means a net advance over the old price of \$160,000.

The Apple Growers' Exchange, of Hood River, Oregon, is another typical example of the advance of price to the producer. Before the organization was effected apples were bringing the grower about 85c. a box. The first year of the organization the price was boosted to \$2.00 a box, and the next year to \$2.60.

Another valuable feature of the exchanges, that cannot be overlooked, is their advertising advantages. With every box of apples from Hood River goes forward a large lithographed trade mark, advertising the goods as well as Hood River. Ninety per



cent of the fruit growers of the United States know Hood River, yet one county in California ships more apples annually than the whole state of Oregon. Hood River ships from 500 to 600 cars of apples annually. Watsonville, California, ships over 3000 cars annually, yet who of you know Watsonville? Watsonville apple growers have no exchange. Their apples are handled by private companies, and these advertise themselves and not Watsonville. You all know of the Earl Fruit Co., the Pioneer Fruit Co., the Pacific Fruit Co., and these are the companies that the Watsonville apples have made famous. Why should such apples not make Watsonville famous?

You may ask, Are conditions in the West such that exchanges would be desirable there and not in New England? I see no reason why the fruit industry of the East should not be encouraged in every way possible. You are justly proud of your apples, because you know that an impartial judge will select your fruit instead of the more highly colored western stock. Knowing that you have better fruit, and knowing that your cost of production and placing that fruit in the hands of the consumer is less, why not demand the prices that your western neighbors get?

The fruit industry of the New England states amounts to \$10,000,000 annually. One per cent of this sum would equal \$100,000—more than five times the amount needed to operate a successful New England Exchange. Yet who would not give this one per cent to see the industry put on a sound financial basis, and it is possible that five per cent might be saved with increased selling efficiency of a well organized exchange.

Only 15% of the land area of New England is under improved cultivation, while fully 50% is capable of being so placed. If you bought an apple orchard in Hood River, you would pay from \$800 to \$1000 an acre, or an orchard in Watsonville would cost even more, yet you can buy land in your own state for one-tenth this amount that will produce just as good fruit as the West. Is this not a just and sufficient cause for encouraging the fruit industry of New England?

Such an organization could be easily effected. Each state would form a district association, and these could be combined into one by electing one delegate each to the general office in Boston. These six delegates would constitute a board of direct-

ors, to manage the affairs of the association. Each district could be composed of local bodies made up of the growers of the different fruit sections. Thus a complete chain could be established from producer to consumer, and much of the trouble of the middlemen would be eliminated, and their profits be returned to the grower where it rightfully belongs.

The time is now right to act. Progress is the result of concerted action, and united action may save thousands of dollars which at some distant future may be valueless. Prices are constantly going up, living expenses are increasing, and there is no moral reason why the producer should not have his share of this increase. In union there is increased strength, and in strength, increased efficiency.

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## THE PEAR-LEAF BLISTER MITE.

By E. H. SIEGLER, Washington, D. C.

Your president, Mr. Keyser, has asked me to give an account of the pear-leaf blister mite, *Eriophyes pyri* Pgst., which infests the pear and the apple and a few other plants of lesser economic importance. There are other species of mites which attack the pear and the apple, but only this particular species causes very much trouble. I shall therefore confine myself to the discussion of this one species. In presenting this subject, I shall endeavor to treat it in a simple way, avoiding all technical terms, as far as possible. Also, since the apple is the fruit of paramount importance in the state of Maine, I shall consider the blister mite chiefly in its relation to this fruit, although what I may say is in general applicable to the pear.

The blister mite, as the name implies, is not a true insect, but is more nearly related to the spiders, ticks and various other well known mites. A true insect is divided into three distinct parts—the head, the thorax and the abdomen. It also possesses a pair of antennæ and three pairs of legs. The blister mite under discussion has its head and thorax united, has but two pairs of legs and is devoid of antennæ.

The older members of this society will doubtless recall the day when apple trees apparently grew naturally in the state of Maine. That is, those who grew fruit in the past did not experience the same difficulty which the present growers do. Since the time of our forefathers, conditions have materially changed. Many new pests have entered our orchards and hence our methods must correspond in order to eradicate them. Not only do the growers of Maine and other states have to contend with native insects, such as the plum curculio, but also they must combat many foreign pests which have been accidentally introduced. The codling moth, the bud moth, the brown-tail and gypsy moths and the San Jose scale have all been imported into our country. Likewise, the pear-leaf blister mite has been introduced, supposedly upon nursery stock.

The blister mite was first scientifically recognized in America at the office of the U. S. Entomologist, Washington, D. C., in the year 1872. Of course, it may have been present in this country many years before that time, but it did not attract the attention of the entomologists until that year. At first, the blister mite in America was regarded as a pear pest, but within comparatively recent years it has been recognized as a formidable enemy of the apple. Since coming to this meeting, I have been informed that the mite is becoming more abundant in certain orchards, especially during the past season.

The true blister mite is very small in size, being about 1-125th to 1-150th of an inch in length. Owing to its diminutiveness, the fruit grower would seldom detect the mite, but must learn to recognize its presence by means of its work. It is an elongated creature, possessing two pairs of legs. The abdomen or body is divided into many rings, usually about 80 in number. The head is terminated in a snout which contains the mouth parts. The young mites are very similar to the adults, except that they are smaller in size. The eggs are microscopic, slightly oval in shape, with bluntly rounded ends and usually whitish in appearance. I might add that the adults are usually whitish, although there are some individuals which have a pinkish hue.

In order to learn how to control any pest, and this might be applied to fungous diseases as well, the life history must be known. By thoroughly knowing the life history, the vulnerable points may be ascertained. The adult blister mite hibernates

over winter beneath the bud scales, usually of the past season's growth. As spring approaches and the weather becomes warmer, the mites become active and they begin to feed at the base of the growing bud scales. Then, as the leaves push out, the mites migrate to the leaves and piercing the lower epidermis, enter and feed upon the succulent tissue within. The irritation caused by the feeding results in the characteristic blister. Within the blister the eggs are laid and these eggs hatch in a period of about seven days, depending upon climatical conditions. In fact, I might say that insect life is largely governed by climate. The young mites, which hatch, continue to burrow around within the blister and when they attain maturity, leave in order to infest other parts of the same leaf, or adjacent leaves. When the mites are especially abundant they will sometimes attack the fruit and fruit stems. I was speaking with Miss Patch for a few minutes yesterday and she informed me that fruit which had been infested with the mite had been submitted to her. The damage to the fruit, however, is usually considered negligible.

Throughout a season, and especially a season favorable to the mite, there are many generations and often every new leaf as it appears is attacked. During the past season I have been living in the vicinity of Winthrop and Monmouth and have found many orchards quite severely infested. During the drought which we experienced, the mite was very active and caused considerable defoliation in some orchards.

I have brought with me some apple leaves which are not badly infested, but which show the characteristic blisters. On the pear, the blisters are usually found along the mid-rib, while on the apple they are distributed as a rule along the margins and toward the base of the leaves. Often the blisters are so close together that they coalesce and form darkened areas. The margins of the leaves often break. The leaves also curl when the blisters are numerous. The blisters upon the pear, especially upon the Kieffer, will often appear reddish, while on the apple they usually turn brownish in color. On examining these blisters on the lower epidermis, it will be seen that they are noticeably elevated above the surrounding surface. One or more small openings will be seen in each blister through which the mites pass in entering or leaving the blister. The blisters vary



somewhat in size and shape but are usually about 1-16th to 1-8th of an inch in diameter.

In a general way I have hastily gone over the life history and described the work of the blister mite. The next consideration will be the means of control. There are three materials which may be employed against the blister mite, viz.: Lime-sulphur, kerosene emulsion and the miscible oils.

Lime-sulphur may be obtained from dealers or manufactured at home. The commercial lime-sulphur usually tests 32 or 33 degrees Baumé. At this strength, I would recommend one gallon of lime-sulphur to eight gallons of water. I realize that the blister mite may be controlled by a weaker solution, but since this will be a dormant spray application, I believe the greater strength advisable. If well applied it will eradicate scale insects at the same time and may also be of fungicidal value.

Kerosene emulsion may be secured from insecticide dealers but is usually made at home. It can readily be made in the following proportions: One-half pound laundry soap, one gallon of water and two gallons of kerosene. The soap is chipped up and dissolved in the boiling water. As soon as thoroughly dissolved, it is removed from the fire and the kerosene poured in. It should then be put through a force pump until a creamy white solution results, making certain that there is no free oil. In making this material in large quantities I employ an ordinary barrel pump. By bringing the hose back into the barrel and then pumping vigorously for about ten minutes, a good emulsion is usually obtained. This is known as a stock solution, containing about 66% of oil. To control the blister mite this should be used at the rate of one part of the stock kerosene emulsion to five parts of water.

The miscible oils are manufactured by several dealers. Usually they are employed at the rate of one gallon to 12 or 15 of water. However, these manufacturers may vary the material and I would advise that you follow their recommendations.

There are two times during the year when growers may spray against the mite. Most recommendations favor the fall application, that is, spraying in the fall as soon as possible after all the leaves have dropped. At this period, some of the mites are to be found exposed in the pubescence of the new wood and



hence the spray material will more readily come in contact with them. The spray application may also be made in the spring as soon as the buds are swelling and the tips of the new leaves just appear.

I believe that, owing to the weather conditions and insect fauna of Maine, the spring application would usually be preferable. For example, this year the leaves have been very tenacious and on healthy trees such is usually the case. The presence of these leaves would not only take up much of the spray material, but would also break the force of the spray. An early winter might also interfere with the fall application. In the spring, on the other hand, there will be no leaves to interfere and further, the pruning will have been done. The annual pruning will remove many of the mites. Burn the pruned wood. Again, if lime-sulphur is employed in the spring as the buds are swelling, arsenate of lead might be combined so as to aid in destroying the larvae of the bud moth, if this insect has been troublesome.

Question: Would "Black Leaf 40" take the place of kerosene?

Mr. Siegler: I have never seen this insecticide recommended.

In actually applying the spray material special care should be exercised to see that the buds of all the new wood are thoroughly sprayed, since the mites hibernate beneath their bud scales. If lime-sulphur is employed the buds should be thoroughly drenched so as to insure its penetration. The oils need not be applied so heavily since they naturally spread more readily, although the work should be thorough.

There is just one other consideration which I would like to mention. This concerns an angle nozzle or the use of a crook so as to throw the spray at an angle of about 45 degrees from the spray rod. We have had a very good discussion on spraying but this point was not brought out. I find that many growers in Maine have not adopted any means to change the angle of the spray material as it comes from the spray rod. I have here a pair of nozzles which illustrate a good type. It is very important, especially in spraying for the codling moth at the time the petals fall, to drive the insecticide from above downward, so as to fill every calyx cup. I also find that some growers, even though in possession of power sprayers, employ but

one nozzle per rod. If a grower has sufficient pressure, it would be economy to employ two nozzles which may be attached to the spray rod by means of a Y.

I have eliminated some of the smaller details, but have covered some of the more essential points. If there are any questions I would be glad to consider them at this time. I might add that the Baldwin seems to be the variety chiefly affected by the blister mite, so far as my observations go, although there have been over 250 varieties recorded.

Question: What is your formula for kerosene emulsion?

Mr. Siegler: One-half pound laundry soap, one gallon water, two gallons kerosene. This gives a stock solution of 66% oil.

Question: Then one in five of water?

Mr. Siegler: Yes.

Question: What is the comparative value of these insecticides?

Mr. Siegler: Lime-sulphur would be the cheapest of the insecticides if it could be purchased at a reasonable figure, followed by the kerosene emulsion and then the miscible oils. However, in Maine lime-sulphur costs considerable,—\$8.50 to \$10 per 50 gallon barrel. If you figure up the cost of the ingredients of lime-sulphur you can see what it is worth. Prof. Stewart recommends a very good formula which is as follows: Fifty pounds good stone lime containing 90% or over of calcium oxide; 100 pounds sulphur; commercial ground or flour or flowers of sulphur might be used, but the latter two are more expensive; 50 gallons water.

Question: Is the lime-sulphur as effective as the other insecticides?

Mr. Siegler: There are different points to be considered. If the lime-sulphur is of benefit as a fungicide we have to take that into account. Also lime-sulphur is a good scalecide. The oils, however, spread more readily. With lime-sulphur, however, very satisfactory results may be obtained.

Question: You have the oyster-shell bark louse the same as we have?

Mr. Siegler: Yes.

Question: Will lime-sulphur cure that?

Mr. Siegler: Trees sprayed with lime-sulphur, one to eight,

every year, will soon be rid of the oyster-shell scale and all other scale insects.

Question: What percentage of the blister mite can you destroy by the use of either lime-sulphur or kerosene emulsion?

Mr. Siegler: In some New York orchards they have almost controlled bad cases by the use of a single application of either of these materials. Arsenate of lead may be combined with the lime-sulphur and applied just as the tips of the new leaves appear. This will aid in controlling the bud moth.

Question: In spraying for the bud moth, wouldn't you have to spray before the buds opened at all?

Mr. Siegler: If you have the bud moth and not the blister mite that would be advisable. If the spray application is made before the buds swell, it would not be so effective against the blister mite. On the other hand, if the spray is applied after the buds have swollen and the tips of the new leaves are just appearing, some of the bud moth larvæ may have done a little injury, but the mite would be well controlled by a thorough application.

Question: What is the formula for the home made lime-sulphur?

Mr. Siegler: Fifty pounds of stone lime, this lime to contain over ninety per cent of calcium oxide. We want a lime as free from magnesia as possible, because the more magnesia you have the higher will be the sludge content, and you want to eliminate that. One hundred pounds of sulphur, preferably commercial, ground. This should be very pure, 98 to 99 per cent. Fifty gallons of water.

Boil this material about fifty or sixty minutes, as a rule. In order to determine when it is done, take a little out and pour it so as to see if all the sulphur granules have been dissolved. Of course small growers cannot well afford to make their lime-sulphur, but it might be made by communities. There is considerable difference in the price in Maine between the commercial lime-sulphur and what it would cost to manufacture it at home.

Question: Have you had any experience with the Rockland lime?

Mr. Siegler: I have not made lime-sulphur in this state. You should ascertain the analysis of this lime. The higher the calcium oxide content, above 90%, the better. If you get a lime

that doesn't contain so much calcium oxide, you would need to use more lime, but this is undesirable.

Question: How much water does this quantity of lime-sulphur take in mixing?

Mr. Siegler: A final volume of about 50 to 55 gallons. In cooking by fire there is, of course, some water evaporated. Therefore, after boiling has well commenced you would want to have about 60 gallons so as to compensate for the evaporation. Then boil it down until all the sulphur is dissolved, which will require 50 or 60 minutes of vigorous boiling. It should be well stirred from time to time, especially at first. In testing the strength of the lime-sulphur, employ a hydrometer and test in the clear solution after it has cooled.

Question: Does all lime that is sold on the market have a certain percentage of magnesia?

Mr. Siegler: No, the lime would vary somewhat in its chemical composition.

Question: Is there lime in the market that is free from magnesia?

Mr. Siegler: Commercial lime usually contains magnesium oxide.

Question: In this dust application they use simply sulphur?

Mr. Siegler: Yes, but I would prefer not to discuss the dust method of spraying. Sulphur is a fungicide and has also been used against certain mites. The dust method, however, might not prove effective against the blister mite under discussion.

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## OUR SUCCESSES AND FAILURES.

By W. H. WOODWORTH, Berwick, N. S.

It is constantly remarked, and perhaps with a certain amount of truth, that farmers as a class are so set in their ideas that it is impossible for a body of them to work together to accomplish any particular purpose.

This movement of which I am to speak to you, was organized in 1907 by a few of the best fruit growers in Berwick, a pretty village in the heart of this fruitful valley.



The method of handling the fruit products of the valley prior to this date was very easy, and eminently satisfactory to a certain few individuals, but far too easy and satisfactory to be much appreciated by the fruit grower.

The European commission houses handling Nova Scotian fruit had their agents over here. During the shipping season these agents had sub-agents at nearly all railway stations from which any quantity of fruit was shipped. The farmer would pack his apples at home and haul them to the station on an appointed day, where the sub-agent would make up carload lots and forward on his immediate superior's orders. These apples were then left to the tender mercies of the consignees who when they eventually sold them would commence piling up an account of charges that were really startling in their ingenuity. A charge was made for every conceivable thing under the sun, including commission for every one who had anything to do with the apples, and when all was deducted that the consignee's conscience would allow, the farmer received an account of sales and sometimes a check representing what remnant of the wreck remained for him.

The farmers chafed under this system of disposing of their products, but individually could do nothing.

An attempt was made about ten years ago to organize some kind of a coöperative movement, but owing to the fact that it was on too comprehensive a scale and lacked the necessary business application, it was a failure.

In 1907 a few of the most up-to-date and energetic farmers in Berwick made up their minds, however, that in coöperation alone was to be found a cure for the state of affairs that then existed. The product from their orchards was increasing year by year and they realized that there were only two ways in which they could give proper attention to the packing and grading of their fruit. One way was to individually build apple houses on their farms large enough to permit of fruit being stored and packed; another was to get together and build or buy a large warehouse on the line of railway where the apples of all could be stored and packed.

The latter was the scheme that appeared the most attractive and these men formed the first coöperative fruit company in Nova Scotia.



This company was called the Berwick Fruit Company and was incorporated under the Nova Scotia Joint Stock Companies' Act, with an authorized capital of \$10,000.00. Warehouse accommodation was secured and during the first season some 7000 barrels of apples were handled. This company did not limit its sphere of usefulness to the mere handling of apples. It aimed also at being an educational power. The leaders of the movement soon found that one of the most important factors in successful coöperative fruit packing was the production of good fruit. The company therefore used its best influence to educate its members and also farmers generally in the matter of careful cultivation, spraying, etc.

At the beginning of the second season the membership of this company was doubled and a new warehouse was purchased.

In 1908 the output of this company was 15,000 barrels, which increased the following year to 22,000.

The early history of this company is a splendid demonstration of what can be done by a body of men associated together for the common benefit.

The superiority of the pack put out secured splendid prices. While farmers outside the company had to be content with \$1.25 per barrel, tree run, for their apples, the members of the coöperative company were receiving \$2.65 for No. 1 grade of fruit, \$1.90 for No. 2 and \$1.22 for No. 3.

News of the phenomenal success soon spread and in 1909 five more companies were incorporated under a new act specially passed to facilitate the incorporation of such companies. The following year saw that number increased.

The apples of all members of coöperative companies are packed at the warehouses by experts. No farmer being a member of a company is permitted to pack any standard variety at home, neither is he allowed to sell except through his company. Thus the companies are able to put up a uniform pack which they can guarantee.

A farmer joining a company agrees to pool his apples and is paid the average price realized for each variety in the three grades. Thus there is a direct incentive to raise good fruit, for the member receives the average prices for the grades into which his fruit packs.

It was realized, however, by the leader of this movement that while much could be accomplished by individual companies, it needed concerted action on the part of all the companies to carry this coöperative idea to its logical conclusion.

The companies were valuable factors in educating their members in the matter of cultivation, spraying, etc., also in the matter of improving the pack of their products, but as individual companies working entirely independently of one another they rather defeated the very idea of coöperation, inasmuch as they became competitors of one another, and speculators were wont to play one company against another, so that the superior pack did not make that extra money that its quality merited.

It was also realized that if the companies could work together large savings could be effected in the purchasing of supplies, such as fertilizer, nails, pulp heads, spray materials, etc. The matter of transportation could also be better and more economically handled.

A conference was held and it was determined that some form of centralization was necessary. At this point, however, the Nova Scotia farmers showed that while they were ready to consider new ideas and act on them if their judgment pronounced them good, yet they would not "buy a pig in a poke."

They decided, therefore, that they would give this centralization scheme a trial for a year and see just what could be accomplished before floating the Central as an incorporate body. An executive of three members was elected from the leaders of these companies, some twenty-two in number, who decided to participate in the movement. The farmers were fortunate in their choice.

As I stated before the companies did not tie themselves to the Central Association in any way. They contributed nothing to found or start it and were under no legal obligation to support it.

The work of the Central was to attend to the matter of transportation, make what sales it would for the companies, buy supplies and generally assist all affiliated companies. Companies wishing to affiliate paid an entrance fee of \$5.00.

To maintain itself the Central charged the companies a small percentage on what apples it sold and earned certain money as will be explained later. This Central Association came into

existence in July, 1911. The whole scheme was an experiment and no company was compelled to supply a single barrel of apples to fill orders taken by the Central if it thought it could do better elsewhere. Under these circumstances it is little short of wonderful that at the end of the season the manager was able to report an unqualified success. Great credit is due to the companies, the majority of which, I am glad to say, stood by their Central. There were a few weak-kneed companies but these dropped out early in the game.

A brief resumé of the work accomplished by this experimental Central Association may prove of interest to you.

In the first place, Nova Scotia had that year a record crop of apples.

The very magnitude of the crop gave the Central its first opportunity to demonstrate its usefulness. With such a large crop there was naturally a lack of laborers to harvest it. The Central advertised for help and in response to their appeal a small army of laborers invaded the valley and were distributed by the Central to the various companies who had previously made their requirements known. These companies in turn passed the help on to such of their members as required it. Previous to this action by the Central Association the valley laborers were demanding an unreasonable remuneration for picking. The advent of the additional help, however, knocked the bottom out of this "hold up" and the growers, even those altogether outside of the movement, were able to harvest their crop at a reasonable rate.

It had long been thought that a good market for the farmers' Nova Scotia Gravensteins could be found in the Canadian West. This splendid apple never had a real chance on the European markets on account of the large quantities of English fruit always available on those markets early in the season and the lack of fast boats to place it on that market in prime condition. The Central engaged a man of marked ability as a salesman, to go west and see what could be done. As a result of his short trip some 12,000 barrels were shipped to the Northwest Provinces by the Central Association. The opening up of this market has proved a great boon to the Nova Scotian apple trade, for, as is ever the case when a new market is found, the old markets were relieved and thereby steadied, resulting in

better prices all around. Verily, in this initial year, the Central Association did not lack opportunities.

Take the matter of transportation, for instance. The supply of steamships, usually all sufficient to carry the apple crop to European markets, proved totally inadequate to cope with the tremendous quantities of early fruit sent forward. The end of September saw the Halifax terminal blocked, its cars of fruit sweltering in the sun and no boats to carry it to market. The Central Association quickly grasped the situation and dispatched four train loads to Montreal, connecting there with fast boats to England. This, however, was only done as a temporary relief. In the meantime they chartered four boats which carried some 40,000 barrels out of Halifax, and so effectually relieved the situation at that port that a similar congestion did not occur again throughout the entire season. I claim that the farmers of the valley were saved thousands of dollars by that action. Not only did the members of the companies benefit, but the entire body of fruit growers. That action alone justified the existence of the Central and should have earned for it the support of all fair-minded and clear-thinking men.

The Central Association proved also a great selling factor. During the season it sold for the companies 102,000 barrels of apples, and what is quite as important, made good prices.

Another very useful work accomplished was the securing of space on steamers and attending to the shipping of the companies' apples. During the season 400,000 barrels of apples were shipped on its bills of lading.

In the matter of marine insurance a great saving was effected. The fact that the Central had some 400,000 barrels to insure, secured for the companies an exceptionally close rate and cut out that little item seen on most account of sales which in the aggregate amounts to a startling figure.

Insurance of the warehouses and contents was also effected at a very close rate, the Central earning the commission usually going to the agents.

Supplies were bought at very low figures. An order for 1,250,000 pulp heads and 500 kegs of nails naturally secured inside prices. The largest saving, however, was made in the purchase of fertilizers. Many companies who had stood loyally by their Central throughout the apple deals backed out when



it came to buying fertilizers. Only a few companies, therefore, were working with the Central on this deal, but even then 2,283 tons were handled. This fertilizer was bought at a saving, compared with the lowest price quoted by any agent, of about \$3.00 per ton. Fertilizer agents assured the companies that they would guarantee them as low a price as the Central could get them, and others advertised openly in the press that they would supply fertilizer at even lower prices than could be obtained through the Central.

Thanks, however, to the business acumen of the managers, the fertilizer agents were soon glad to withdraw those advertisements and the companies who stood by the Central were able to divide a net saving of \$6,800.00 on their fertilizer deal.

I know some companies whose lack of faith in their Central cost them \$4.00 per ton on their fertilizer supplies. One should not be too ready, however, to blame those companies; after all, it was only an experimental year and it is not strange that some should look askance at the idea of giving their order blindly without knowing how much their goods would cost them. At the same time all the more credit is due to those who were sufficiently imbued with the right spirit of coöperation to do this.

The great thing for the individual to remember, however, in a coöperative movement, is that after all it is not a Central Association selling you material; it is you yourself buying material at first cost through your own buyer, that is, your Central Association. The Central did not work to make any profit out of the affiliated companies. Supplies were distributed at cost and apples were sold at cost. A small levy was made on all apples sold to cover the expenses of the Central, but owing to the economical manner in which things were worked out, money being earned by the Central in various ways already indicated, the entire business of the companies was handled at the ridiculously low cost of three-eighths of a cent per barrel.

Thus did the leaders of this movement demonstrate to the farmers what could be done by coöperation.

During the winter months a special bill had been prepared to enable the Central Association to be incorporated. This bill, with certain modifications, was passed by the House of Assembly at Halifax.



Steps were taken in June, 1912, to complete the organization of this movement and to incorporate as many companies as possible into one central body.

The speculators who had so long made a very lucrative living out of the farmers did not allow this organization to be effected without a determined opposition, but thanks to the zeal and untiring energy which was put into it, twenty-four of the twenty-seven coöperative companies signed the Memorandum of Association, which gave birth to the United Fruit Companies of Nova Scotia, Limited.

The company is incorporated with an authorized capital of \$50,000.00, of which \$42,000.00 is subscribed, each subsidiary company subscribing 20% of its authorized capital.

The organization meeting was held at Kentville on July 8, 1912, the companies being represented by seventy-two delegates. By-laws were adopted and directors and officers were appointed, each company being represented on the directorate by one representative.

Three other companies have been formed and have come into the Central Association since organization, so that there are now twenty-seven companies.

All the companies agreed to come in under a by-law which gives the Central Association complete control of all their fruit. All apples are pooled and average prices are returned to the companies according to the class and grade of fruit packed out.

These companies collectively have a membership of about 1500 of the most up-to-date and progressive farmers of the valley. The United Fruit Companies can therefore claim to have control of the best fruit produced in the finest fruit producing district in Canada.

There are thirty warehouses belonging to the companies, having a total frost proof storage capacity for 420,000 barrels of apples. These warehouses are turning out on an average 20,000 barrels of apples a week. Three of the companies have erected evaporators where the cull apples are used up, thus reducing waste to a minimum. It is the aim of the United Fruit Companies to establish and maintain a uniform high standard of pack which they guarantee. It is considered that in this way a demand will be created for coöperative packed fruit which will naturally mean higher returns. Already the superiority of

this pack has been noticed. Fruit inspectors have reported on it to Ottawa, and Ottawa in turn has congratulated the companies. Uninterested persons in various parts of Canada have commented on it in the press. And above all it is reported that the European buyers have caught on to it and now look for and demand the coöperative mark. Thus it can fairly be said that the aim of the companies has been accomplished.

Great importance is attached to this matter of good pack, and to maintain uniformity the chief inspector visits every warehouse constantly, spending a little time at each, inspecting barrels packed, and instructing. His reports concerning conditions prevailing at each warehouse are carefully noted and filed.

New markets are constantly being sought and in this connection much valuable work has been accomplished. Markets on the continent of Europe hitherto supplied through a series of middlemen are now being supplied direct and trial shipments are being made to other hemispheres where the Nova Scotia apples, the apples with the flavor, have never previously been tasted, but where it is hoped a demand will be created.

As the shipping season is only in its early stage it would be premature to talk about what has been accomplished this year. Suffice it to say that up to October 31st, 155,000 barrels and 16,000 boxes had been shipped and quite a fair proportion of this quantity had been shipped to fill orders.

The worst feature of the Nova Scotia crop this year was the enormous quantity of black spot. To a great extent this was due to carelessness on the part of the farmer. Last year there was an entire absence of spot which lulled the grower into a sense of false security. Indeed, he has had a rude awakening, for this year climatic conditions were particularly favorable to the growth of fungus and in orchards where little or no precautions were taken Kings' Fungus reigned supreme while in neighboring orchards where better sense had prevailed Kings' Dollars reigned instead.

The wonderful success that has attended the coöperative movement is having a telling effect and applications are being constantly received from responsible farmers asking for assistance in forming companies in their neighborhoods. Seven such companies are now in course of organization and at the end of

the apple shipping season a vigorous campaign will be conducted to still further extend the scope of this movement.

It is not proposed that the shipping of apples and furnishing of fertilizer shall be the sum and substance of this movement. A more ambitious program is mapped out.

It is proposed that in time everything that a farmer requires on his farm or in his home can be purchased through the co-operative companies. Advertisements are seen daily, setting forth the advantage of buying direct from the makers. Through the co-operative movement the farmer will get his supplies direct from the makers, minus even the advertising expenses, and with all the saving in cost which is always effected when a large quantity of any material is bought.

Through coöperation the farmer buys his supplies direct from the producer and sells his product direct to the consumer. The small army of middlemen who have been making a comfortable living out of him on both sides has to retire and he, the producer, gets the full value for his money on the one hand, and gets all the money that his produce makes on the other.

As I stated before, the United Fruit Companies have a very ambitious program on. It figures such items as the erection of cold storage plants, the running of a line of refrigerator cars, erecting or purchasing large departmental stores, erecting saw-mills and cooperage and box-making shops, and even banking and insurance. Indeed, the possibilities are unlimited. See what has been done in Europe. Who will say that what Denmark has accomplished is not possible in Canada?

One doesn't expect all this in a year, or two years, or even five years, but given judicious management and capable officials in all departments and in ten years I look to see the United Fruit Companies of Nova Scotia the most powerful organization in Eastern Canada.

The Central Association has an efficient office staff working on an organized system initiated by the writer.

Instructions are sent out from the Central office constantly to all the subsidiary companies, directing as to varieties to be packed and how, when and where to be shipped. Space on the various boats is allotted to the companies and directions issued as to method of shipping, etc.

Statistics are compiled showing quantity and condition of crop throughout the American continent and Europe. Constant telegraphic advices are received and recorded, giving total estimated shipments of apples from all ports to all ports. Prevailing conditions on all markets are recorded daily and reports received from our representatives and agents from all markets touched by the North American fruits.

All these reports are carefully studied and instructions are issued as a result.

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## THE PRESENT AND FUTURE OF APPLE GROWING.

Address by S. H. FULTON, Sleepy Creek, W. Va.

Within the past twenty-five years apple growing has become one of the great branches of agriculture in this country, eclipsing, in area of orchards planted and in quantity of fruit produced, all other fruits common to the temperate zone. The attractiveness of this fruit, its palatability and its health giving properties, together with the fact that it is in season practically the year around, all combine to make the apple the greatest single asset of American horticulture. When the census of 1910 was taken, there were 151,323,000 apple trees of bearing age in the United States. Among the states of the Union, Missouri ranks first, having in round numbers, 20,000,000 bearing trees; New York stands next, with 15,000,000; Illinois third, with 13,000,000 bearing trees, and so on down the list. With such vast interests in apple growing, it is not surprising that anything pertaining to the culture of this fruit is of keen interest not alone to rural horticultural circles but even to town and city people with money to invest. Within the past decade, hundreds of people unacquainted with the orchard business, but allured by tales of great profit in orcharding, have invested large sums of money in apple orchards. This is particularly true with reference to orchards located in sections where large areas of cheap undeveloped land can be secured, as in the Virginias, western Maryland, southwest Pennsylvania and sections of other states which might be mentioned. In Maryland, within forty miles of the home of the writer, one company is develop-



ing in apple orchards an immense tract of 40,000 acres and selling in ten-acre units to investors all over this country and abroad. The published circulars of this company are so alluring and the salesmen so enthusiastic over the orchard business that sales have been made much faster than the land can be cleared and planted. Plantings by practical individual growers and close corporation companies with good managers have also been very extensive within the past ten years. In the sections above mentioned, young well-cared-for orchards of from 200 to 500 acres are not uncommon. In addition to these heavy eastern plantings, the middle west and the Pacific northwest must also be taken into consideration. In these latter sections there has been unprecedented activity in the planting and development of apple orchards within the past few years.

This brief review of existing conditions serves to bring practical apple growers face to face with the fact that competition will shortly become keener and marketing problems will become more difficult. Of course not all these vast plantings will ever come into bearing, but the next few years will witness a great increase in the number of bearing trees of the country and we must prepare to meet the conditions. In the coming era of close competition, certain essential points in orcharding should be kept fixed in the grower's mind. There will not be space in this brief paper to enter into the details of the many problems surrounding the apple business from the time the ground is prepared and trees planted until the orchard is brought into bearing and the fruit placed in the hands of the consumer, so the writer will touch only upon a few vital points relating to the apple industry.

One important question is that of varieties. Advertising schemes and plans to educate the people to eat more apples are beginning to bring results. But in addition to consuming more fruit, the public is beginning to recognize the fact that all apples are not Baldwins, Northern Spies or even Ben Davis. They begin to realize that some apples are better than others and they demand the better varieties. Ten years ago when we made our largest planting of apples, we in common with other growers of the eastern Pan Handle of West Virginia, planted heavily with York Imperial and Ben Davis. We also planted in a more limited way, Grimes Golden and three varieties of summer and



fall apples. Grimes Golden was then considered rather a doubtful variety for profit. At that time York Imperial and Ben Davis sold on a par, while buyers took Grimes Golden reluctantly at about twenty-five cents less per barrel than was paid for other varieties. This past season the prevailing price for Ben Davis was \$2.75, for York Imperial \$3.25, and for Grimes Golden \$4.00 per barrel. In other words, York Imperial brought fifty cents and Grimes Golden \$1.25 more per barrel than Ben Davis. It should be stated, however, with reference to varieties, that many apples of high quality are poor bearers and some possess constitutional weakness in the tree. On the other hand, many of the medium and low quality varieties are strong and hearty in tree and abundant bearers. Under these circumstances, it may pay the commercial grower better to raise large quantities of medium quality apples at a fair price than to produce a limited quantity of high class fruit at a high price. Whether the crop is to be sold on the open market or to the retail trade should also be taken into consideration. Low quality apples can often be sold to advantage on the open market but would be rejected by the retail trade. This season in shipping on orders to mountain towns in West Virginia and Maryland, we found it very difficult to dispose of Ben Davis, while other varieties sold readily. Were we to be dependent upon the retail trade, we would commence next spring to graft over all our Ben Davis trees. It is possible that changing conditions of the general market may yet bring us to this point.

In a good many fruit growing sections apples which are in season during late fall and early winter are not receiving as much attention as they should. After peaches, pears, plums and other summer fruits are gone, there is a demand, poorly supplied in most markets, for good eating apples. It is a mistake to try to meet this demand with hard fleshed winter apples unfit for immediate use. Rambo, Wealthy, Maiden Blush, McIntosh and other excellent varieties of this season furnish a list from which the grower may select.

In the eastern fruit belt of West Virginia pruning is one of our big problems. This very important operation in the upkeep of an orchard is apt to be neglected outright or at least receive little attention. Doubtless the pruning problem also is, or should be, a serious consideration with Maine apple growers. The

style of pruning, that is, whether the tree shall be trained with open head, closed head with central shaft or leader, two story, or to some other recognized form does not matter greatly, provided the style once adopted is adhered to year after year. However, the extent to which apple trees are pruned does matter greatly. Unless the tops are kept sufficiently thinned and open to admit plenty of light and air, the fruit will be poorly colored, unattractive in appearance and in the case of certain varieties, very much inclined to scald in cold storage. Personally, the writer likes low, open centered trees because of the increased area of the top exposed to light and air and because of convenience in pruning, spraying and harvesting the crop.

Spraying, cultivating and fertilizing are all operations demanding careful attention on the part of apple growers but these topics have been discussed by other speakers and will be passed over by the writer of this paper. It might be stated, however, in passing, relative to cultivation, that a practical orchard tractor should prove a valuable acquisition to the grower whose orchards are extensive enough to justify the necessary outlay. A number of manufacturers, at the present time, have gasoline and oil tractors on the market designed for farm and orchard work, but most of these outfits are not fully adapted to the needs of the practical grower and furthermore the price is so high, in most instances, as to be considered prohibitive by most orchardists. A few hours' work with a tractor in low headed, closely planted trees will convince any one that under such conditions, a tractor to work successfully must be low and compact with short wheel base, capable of turning in a short space. The wheels should be broad and well cleated for work on soft ground, and the engine should not develop less than 15 horse power at the draw bar. Some makes of tractors approach these specifications, but most of them are built too high and require too much space for turning. The usual price, of from two to three thousand dollars, is beyond the reach of the great majority of apple growers. A practical working outfit, at a cost not to exceed ten or twelve hundred dollars, would appeal to growers generally throughout the country, to supplement and to a certain extent take the place of horses and mules. The automobile and motor truck are practical where roads are good, and prices are no longer excessive. These modern inventions

are in use by a good many fruit growers in various parts of the country. It is to be hoped that the orchard tractor will shortly be gotten down to a practical working basis and the price materially reduced. In the rush of spring work, it is often impossible to get the orchard land worked over in good time with horses and mules, and, furthermore, teams are necessarily idle a good share of the year on the average fruit farm while expenses for feed and care go on just the same.

In harvesting, winter apples should be allowed to hang upon the trees until well colored and fully developed. This will insure attractive appearance and good keeping quality. Practically all of the decay which occurs in stored apples in the early part of the winter, is due to injuries in handling. The unbroken skin of a sound winter apple is very resistant to rot, but once the skin is broken or punctured, rot spores gain entrance and decay results. Careful handling is particularly essential in box packing as the box is designed for fancy fruit and freedom from punctures or bruises is very necessary.

Ordinary barrel packing is usually done in the orchard just as the fruit is picked. Occasionally the apples are hauled to some central point or to a packing shed and there packed in barrels but this practice is not common. For box packing, however, a packing shed of some kind is very necessary. Facilities must be at hand for convenience in grading and wrapping and all needed supplies such as box materials, wrapping paper, box liners, labels, etc., must be kept under cover. This means hauling the fruit to the packing shed and the wagons used for the purpose should be low down and equipped with bolster springs. Round, drop handle, half bushel picking baskets are very convenient for use in picking and hauling to the packing shed.

Careful, systematic work is essential in packing both barrels and boxes. In facing apple barrels the selection of specimens of uniform size so that it will require just so many apples of a certain grade to face a barrel, will facilitate the work and add to the attractiveness of the package. In box packing systematic work is the only kind that will be worth considering. A certain number of apples in each layer and in each row of the layer is absolutely necessary so that the box when completed will contain a fixed number, depending upon the size of fruit adapted to any one of the standard packs in common use. This means

careful grading. Box packing tables can be obtained through a number of the experiment stations and once the style of pack for a given size of fruit is learned, the work becomes fairly easy and is a pleasure to the packers. Home help can soon be broken in to the work, though it will require considerable practice to acquire speed in handling the wrappers. In West Virginia, we have found expert Florida packers who come to our section to pack peaches very efficient for box apple packing. Being skilled in the wrapping and packing of tomatoes and oranges, they quickly learn the various apple packs and acquire good speed with a single day's practice. These packers work their way northward after the tomato season is over in late spring in Florida. The usual wages paid these packers is two dollars per day with board and lodging and railroad fare one way from the point at which they last worked.

Box packing calls for wrappers, box lining paper, layer paper, labels, a convenient packing table and a box press. It will not pay one to attempt box packing on any extended scale without all necessary supplies and equipment.

Within recent years there has been considerable agitation in eastern apple growing sections relative to the box versus the barrel for apple packing. In reality there should be no controversy. Tender fleshed varieties of high quality are better adapted to box packing than to barrel packing. On the other hand, firm fleshed apples of only fair quality are best suited for barrel packing. Whether to use boxes or barrels is a question for the individual grower to decide. If he finds he can realize more for his apples packed in boxes than in barrels, then the box is the package for him to use. This past season we packed our Wealthy, Jonathan and Grimes Golden in boxes to very good advantage. When it came to York Imperial and Ben Davis we dropped the box and used the barrel as these varieties did not go well in boxes. The barrel commends itself highly to the man who has large quantities of medium grade fruit to handle and who must depend upon inexperienced help for packers. Doubtless the barrel will continue to be the package generally used for the great bulk of eastern grown apples.

Marketing is one of the greatest problems which confront the average apple grower. Growers not infrequently produce good crops of well grown fruit and yet fail to realize profitable re-



turns because of unfavorable conditions at marketing time or because of improper methods of handling. Usually the apple crop is sold on the trees on the basis of so much per barrel delivered at the railroad station, the grower to furnish the barrel and do the picking and packing under the supervision of the buyer or his representative. This simplifies marketing very much and the fact that this method has become a general practice is an indication that it has been found at least a fairly satisfactory system. Winter apples at harvesting time are not in condition to be put on the market for immediate use. The grower must either store his fruit and hold it until ready for consumption or sell to some buyer who stores for later marketing. Usually the grower needs the money for paying his package and labor bills and prefers to realize at once by selling his crop at harvesting time. He generally feels also that he does not wish to take chances on a rise in the market during the winter months and does not like to face cold storage and repacking charges incidental to storing the crop. However, if prices are low at harvesting time or if for other reasons the grower concludes to handle and market his own crop his problems are greatly multiplied. He must pack for the needs of a retail trade, he must be prepared to meet competition, he must advertise, he must know when to sell, he must collect his bills from a number of individuals and firms instead of from one firm. This system of marketing, while it is more taxing on the grower, usually secures wider distribution of the crop and better prices and if practiced to any considerable extent redounds to the benefit of the whole apple industry. Wider distribution and the supplying of small towns not accustomed to securing a regular supply of apples will aid in solving the problem of over production in full crop years.

The future of apple growing is a matter of no small concern at the present time to practical orchardists in this country. Overproduction, the ghost which at times haunts the minds of many fruit growers, looms up big in the hazy future. With thousands of acres recently planted in all parts of the country and millions of young apple trees developing, it would at first thought seem impossible ever to market at a profit to the grower, the great quantities of apples which seem likely to be produced within the next ten years. However, it should be borne in mind



that not all the orchards conceived in enthusiasm and planted with dreams of great profits in the near future will ever come into bearing. Apple growing has been boomed too much both for the good of the orchardist and the man with money to invest. The idea of large profits has been exploited with little or nothing said of the failures in the business, thereby bringing about, in many instances, blasted hopes and an extravagant waste of money. Already reaction is beginning to set in and fewer orchards are being planted than were set out from three to five years ago. Inexperienced companies and individuals are beginning to learn that it takes money to plant and develop an apple orchard. The writer has in mind a young orchard of two hundred acres finely situated in his vicinity which was entirely abandoned this past summer because the company owning this property ran out of funds and were unable to secure more money. From the vast unit system plantings of promotion companies, we have little to fear. Usually the management is very poor so far as the upkeep of the orchard is concerned and the whole scheme is impracticable so far as raising fruit is concerned. However, the increased planting of experienced individuals and well financed companies with efficient management will doubtless swell the production of apples in this country within the next few years. We shall probably see some years of low prices, but the practical conservative grower will weather the storm. Low prices will cause the neglect and abandonment of many orchards which are being run on a narrow financial basis. Low prices also will bring about wider distribution and increased consumption. The population of this country is steadily increasing, which means greater home consumption, and the foreign market for apples is being gradually extended. There came to our shores during the last fiscal year immigrants to the number of 1,197,892. While it is true these immigrants do not eat many Hood River Jonathans or Maine Northern Spies, still they do consume a good many low grade apples, canned and dried fruit and other cheap products of the apple. Advertising the apple will help to increase the demand. In this movement the grower can lend his aid and influence. Apple shippers and handlers having designated October 21 as National Apple Day are doing a good work in exploiting the merits of the apple and increasing the demand for this fruit. When apple day came

around last month it was quite generally observed in most of the large eastern cities. Commission houses, restaurants and retail stores made a special effort to center attention on this particular fruit. Many schools in apple growing regions devoted a portion of the day to specially written articles on the apple and in the cities many samples were given to the poor, to orphan asylums and to hospitals. The Chicago papers participated in the celebration, telling the people about the abundance of the fruit and its beneficial effect. In Baltimore about 35,000 apples were distributed among the children in the orphan asylums. In New York, restaurants in the produce district made a special display of apples cooked in various styles.

Referring again to the heavy planting of apples made within the past few years, it should be stated that this great increase is offset to a considerable extent by the decline of hundreds of small orchards scattered over the country. Only a few years ago from many small railroad stations in the older apple producing states such as Maryland, Ohio and Michigan, from one to five or more carloads of apples were shipped each fall to the city markets. Now the small farm orchards are gone and no fruit is shipped. This decline has been due to neglect, ravages of the San Jose scale, etc. In the ten years intervening from 1900 to 1910 the United States census showed a decline in bearing apple trees in the United States of from 201,794,000 to 151,323,000 or 33.4 per cent. It will take a considerable share of the newly set trees to offset this decline. The apple business is falling more and more into the hands of the specialist and the man who makes apple growing the dominant feature of his farm operations rather than a side issue.

It rarely happens that we get anything like a full crop of apples in all sections of the country in any one year. This fact also tends to relieve, to a considerable extent, the tenseness of the situation so far as over production is concerned. In 1896 we had the largest apple crop this country has ever produced. In 1910 the next largest yield occurred. Here was an interval of 14 years between the two big crops. The well established grower can withstand an occasional year of big crops and low prices.

High transportation rates and expensive methods of distributing in the large cities militate against the apple business. The

grower can unite with the apple shippers and handlers to secure better transportation rates. When the fruit reaches the city on consignment, commission men, jobbers and retailers all take a liberal share of the dollar paid by the consumer, leaving the grower a much smaller fraction than that to which he is entitled. How to eliminate these middlemen is not so apparent. In some instances the grower is in position to deal directly with the retailer or consumer, thereby securing a larger share of the dollar. But usually he must let his fruit go through the ordinary channels of trade. If the parcel post weight limit is raised and the rate decreased, this will help the grower who is in position to retail some portion of his crop.

On the whole there can be little question but that the apple grower who continues to give his trees good attention through both good and bad years, who produces high class fruit and who grades and packs carefully will continue to find apple growing profitable. If he is situated within easy reach of the large eastern city markets his chances for success will be greater. With reference to nearness to market, Maine growers are particularly fortunate and may be able to produce apples at a profit in those years when more distant sections ship at a loss on account of heavier freight charges.

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## BEES INDISPENSABLE IN MODERN HORTICULTURE.

DR. BURTON N. GATES, Massachusetts Agricultural College,  
Amherst, Mass.

*Ladies and Gentlemen:*—I observe that I have a varied audience. Some are young folks who would know of life of bees; doubtless, too, I have some bee keepers who would hear something of the technicalities of the industry; and I know I have horticulturists. I am quite accustomed to speaking to bee keepers of specialized bee keeping procedures, but to a mixed audience it is frequently necessary to vary the subject. I will try to present three or four different themes for your consideration. I will tell you something of the importance of bees in horticulture; something of the natural history of the bee, how it

behaves, the wonderful and almost mystic activity of the bee which may be closely compared to the activity of the human race; something of the fundamentals in handling bees; finally, I will show you some pictures.

#### BEES FOR HORTICULTURE.

First of all, I will consider the intimate and important relation of bees to horticulture. The Chairman has already given the key to the situation. I will further make a presumption. If, for instance, by a command, all the bees, both wild and those under domestication, could be wiped out, say from a given district or locality, it is a safe prophecy that but few fruits and vegetables would set during the following season. In a word, so important in the setting of fruits and vegetables are the honeybees that the supposition might include merely this race of bee life. It is common experience and even the result of experimentation that honeybees do the major part of the work in pollinizing orchard fruits, small fruits and many vegetables. Illustrative of this recognized importance, colonies of bees are now being kept in orchards purposely for their services as carriers of pollen, the male element of the flower, which is so essentially necessary in the maturation of fruits. Later, when the slides are thrown on the screen, I will show you some of these apiaries in commercial orchards. I will also illustrate what happens to an apple, for instance, if the pollen is not satisfactorily deposited on the stamen. It will be seen that the resulting fruit is either malformed, one-sided, lopsided, or otherwise unmarketable. In this connection, fruit growers are recognizing more and more that cross pollinization especially, results in larger fruit, with better texture and quality, for it is known that many and perhaps most of our fruits and vegetables require cross pollinization and cross fertilization for their maximum and most satisfactory development. An exception to this is the Baldwin apple, which is, in a measure, self-fertile.

In Massachusetts, within two or three years, an industry which is worth a million dollars and probably a million and a half dollars to the state, cranberry growing, has demonstrated that this crop is set essentially by the agency of the honeybee. Some other insects, as solitary bees, it is true, play a part, but the honeybee is the important agent.



Bees have become quite indispensable in greenhouse growing of fruits and vegetables, which in Maine is probably not as large an industry as in some other states. In Massachusetts, however, the growing of cucumbers under glass is a peculiar specialty. In these cucumber greenhouses, from 2,000 to 2,500 colonies of bees are used annually for the purpose of setting the cucumbers. It is likewise found that bees are equally important in melon houses; for melons grown out-of-doors as well, bees are being utilized.

In the Connecticut Valley of Massachusetts, as elsewhere, there are large market gardens growing nothing but cucumbers for pickling purposes. It is being recognized that the services of bees are also of vital importance in this industry. Cucumber growing out-of-doors is closely associated with squash growing and with melon growing. A melon grower, for instance, in the vicinity of Springfield, told the speaker that he attributed his successes in large crops of muskmelons and cantaloupes which he sends to the finest hotels in the country, to an investment of perhaps \$2.50 a year paid a neighbor bee keeper for the rent or services of a single hive of bees which he maintains in his melon plantation. Doubtless this one colony may mean all the difference between success and failure. To summarize, it is being demonstrated that all cucurbitaceous vegetables require the services of bees and the crops benefit in proportion.

A specific instance of the importance of bees to the practical orchardist, is shown in an observation on two orchards of about equal acreage in a western "pocket" in the foothills of an admirable fruit land, well drained and protected from frost. One grower secured large crops, while his neighbor secured none, though his fruit trees were of the same age and blossomed heavily each spring. The owner, in despair of financial ruin, called for assistance upon the State Experiment Station. A specialist, who was a pomologist and entomologist, investigated the two entirely comparable orchards, but was about to return without solving the problem when the question of bees arose. Upon inquiry it was asserted that no bees had been maintained for either orchard. Going over the ground more carefully, however, the specialist found in a neglected corner of the fruiting orchard, a fallen log partially sunken in the damp land. This sheltered a very large colony of bees; to it is attributed the



success of the orchard. The following season bees were provided in the orchard which had previously failed, with the result that the owner netted \$3,800 on his crop.

It is well to stop a moment and inquire why the services of bees are so indispensable. You horticulturists doubtless know the key to the situation, or at least you know one key, namely, that bees are the carriers of pollen from the stamen of one flower perhaps to the pistil or female organ of another flower. Pollen thus transmitted from stamen to pistil is spoken of as cross pollination. When this minute pollen grain reaches the sensitive stigma, a "pollen tube," or the outgrowth of the pollen grain, penetrates down through the pistil to the embryo seed or ovule where there is a union of the contents of the pollen grain and the ovule. This is spoken of as fertilization. This very common phenomenon is widely understood and it is recognized that bees function in its accomplishment. But it is in a deeper sense that the honeybee is important in the fruit and vegetable industries.

It is well known that the prevalence of all wild life, plant or animal, is subject to fluctuations due to favorable and unfavorable environmental conditions. Some years in a locality there is a pest of mosquitoes or house flies. In succeeding years they may be few. It is so with the game birds and the fish of the sea; they are plenty or scarce from time to time. It may therefore be expressed as a biological law, that the prevalence of all life is subject to fluctuation; bees have their periods of ups and downs. When favored they rise to the crest of prosperity and prevalence. It may be that disease enters a locality and reduces their numbers. Hard winters may also depreciate them so that in a year when they are needed for their service as pollen-bearers, they are at a low ebb.

When the horticulturist realizes that he is depending on this fluctuating service of wild bees, he asks what he can do to overcome the unreliability and assure himself of a maximum crop or a more even crop. The recommendation would be to establish an apiary in proportion to the size of the orchard or garden. This eliminates any dependency upon wild bees or honeybees from neighboring apiaries. Yet their additional service will do no harm. It is far better to flood an orchard with bees during the blooming period than to have a scarcity. Furthermore, the

cost of the small apiary is infinitesimal as compared with the possible benefits and returns.

It should also be remembered that during fruit bloom, particularly, weather conditions often prohibit free flight of bees, hence they should be near at hand to perform their service. Numerous observations are on record in which orchards were successfully fertilized when the bees had less than a quarter of a mile to fly, while more distant orchards bore no crops. Thus the apiary in or adjacent to an orchard will safeguard failure.

A question which is frequently asked is, how many colonies of bees are necessary for a given number of mature apple trees or for so many acres of cucumbers, cranberries, raspberries, etc. With respect to the apple, two ratios have been advised. I used to say that for each 50 bearing apple trees, the services of one colony of bees is recommended. Within a year, I have talked with large fruit growers in Ontario and elsewhere, who assure me that I am quite wrong, and who recommend the provision of one colony of bees for every 25 fruiting apple trees. This recommendation is made with the idea of keeping up that efficiency curve already spoken of, so that in the blooming period of the fruit orchard there will be available a sufficiency of bees to successfully pollinize the blossoms. As is said above, it is far better to flood the orchard with bees during the blooming period than to have a scarcity.

In summarizing, an horticulturist or orchardist may fertilize soil, cultivate, prune, thin, spray and do all those things which modern practice advocates, yet, without this agent, the honey-bee, to transfer the pollen from stamen to pistil, the results may be nothing. It is a matter of assurance or insurance and protection. It is a slight expenditure in comparison to the possible and probable returns.

#### THE MANIPULATION OF BEES.

It is not possible in a few moments to make bee keepers of each of you, but it is possible to throw out a few suggestions for manipulation and procedure which are so fundamental that they apply not only to the one who is a prospective bee keeper, but to the bee keeper of experience as well. People sometimes regard the bee man who seemingly handles his bees with perfect impunity, as a trifle abnormal or perhaps as one who pos-

sesses some supernatural power which it would seem he exerts over the bees, enabling him to handle them at will. The operator may pick them up by the handfuls, and as I have seen one demonstrator do, may place a handful in his mouth, afterwards allowing the bees to fly forth one at a time. Such manipulations seem supernatural to the uninitiated who habitually regard bees as vicious and untamable; but as a matter of fact, it is quite simple and I assure you that it will be quite possible to teach any and all of you to handle bees with a similar proficiency.

There are a few fundamental features. In the first place, move slowly when operating a colony of bees or when moving about the bee yard. Quick movements invariably attract bees. They fly quicker than the eye; you cannot dodge them. Another key to the situation is the use of a little smoke, not necessarily tobacco smoke, but a smudge made from punky wood, excelsior or old burlap sacking. Such a smudge is easily made in this instrument which is called a bee smoker. Every bee keeper should have one. It is almost as requisite in handling bees as knives and forks are in eating. This is merely one type of a smoker and illustrates a strong type. It is known as the Standard Root Smoker. In this tin can a smudge is built; before opening a colony puff a few jets of smoke in at the entrance; two or three will be sufficient and will materially quiet the inmates. Occasionally an obstreperous colony requires more smoke. In handling Cyprian bees, smoke should be avoided, but in place of it the colony should be jolted or jarred. This procedure is quite the reverse of that recommended in handling all other races of bees. Pounding on the hive, jars or jolts will usually excite races other than the Cyprian, and sometimes cause them to be cross. The use of smoke or in case of the Cyprian bee, the purpose of this jarring, is to cause the bees to gorge with honey. In this condition it is known that they are less prone to sting, which of course explains the procedure.

The majority of bee keepers prefer to protect their faces from possible stings by the wearing of the veil which is put over a broad brimmed hat, like a straw hat, and which comes down over the face, fastening under the coat, or drawing tightly around the chest. Professional bee keepers, however, do not wear gloves, but prefer to take a sting occasionally rather than to be inconvenienced by them. The beginner, however, may gain confidence by using them, yet he will soon discard them.

I think there are those here who would like to see the practical and advantageous features of the modern hive illustrated. This one here, which is from the exhibit, may be demonstrated. It is called the ten frame Langstroth hive. The parts of this hive, beginning at the bottom, are the " $\frac{7}{8}$ " bottom board, the body or brood chamber in which all the young bees are reared, and the part above the brood chamber which is called the super and is the place where the honey is stored. Over all there is the cover. The type of cover which is preferred consists of two parts, namely, the inside thin cover, and the outside metal roof telescoping cover. Opening this super, you will see that it consists of numerous boxes which bee keepers call section boxes. In this it is that the honey is stored which, when sealed, weighs approximately a pound. These section boxes fit four in a row in what are called section carriers. They are separated, which prevents the bees from building crosswise from box to box by a partition, known as a separator. There are two kinds of sections, square sections and oblong sections.

Analyzing the brood chamber, it will be seen that it consists of ten frames in which the brood combs are built. This particular frame, as the name of the hive would denote, is called the Langstroth. To keep these frames separated, they are spaced by what bee keepers call the Hoffman self-spacing devise. In each of these frames, bee keepers stretch wire which they imbed into this sheet of foundation. Foundation is merely pure bees wax run out between rollers bearing the impression of the cells. It is the basis or septum of the comb and while some have spoken of it erroneously, as artificial comb, this name is not in any way applicable. If there is any one thing which I would impress upon you, it is that there is no such thing as artificial comb. There has been for years a premium offered of a thousand dollars to anybody who will produce one pound of artificial comb honey. This premium has never been claimed nor is it likely to be. Bee labor is cheaper than human labor. Humans cannot compete. Foundation is, as the name implies, the base on which comb is built.

It is used merely to save the bees labor and to supply them additional material on which to work.

In the cells which the bees would normally build on this foundation in this frame, would be laid the eggs by the queen which

would develop into grubs and finally mature as worker bees. The adult bees would deposit in some of these cells the pollen, the very thing which the fruit growers want transmitted from tree to tree or blossom to blossom. There would also be a certain amount of honey stored in some of these cells. It would be in this part of the hive that the colony would pass its winter. The discovery and invention of these frames were made by the Rev. L. L. Langstroth, whose name marks an epoch beginning about 1850, in the advancement and progress of apiculture. Langstroth is furthermore said to be the father of modern bee keeping. Without his discovery, it probably would not have been possible to have made bee keeping commercial.



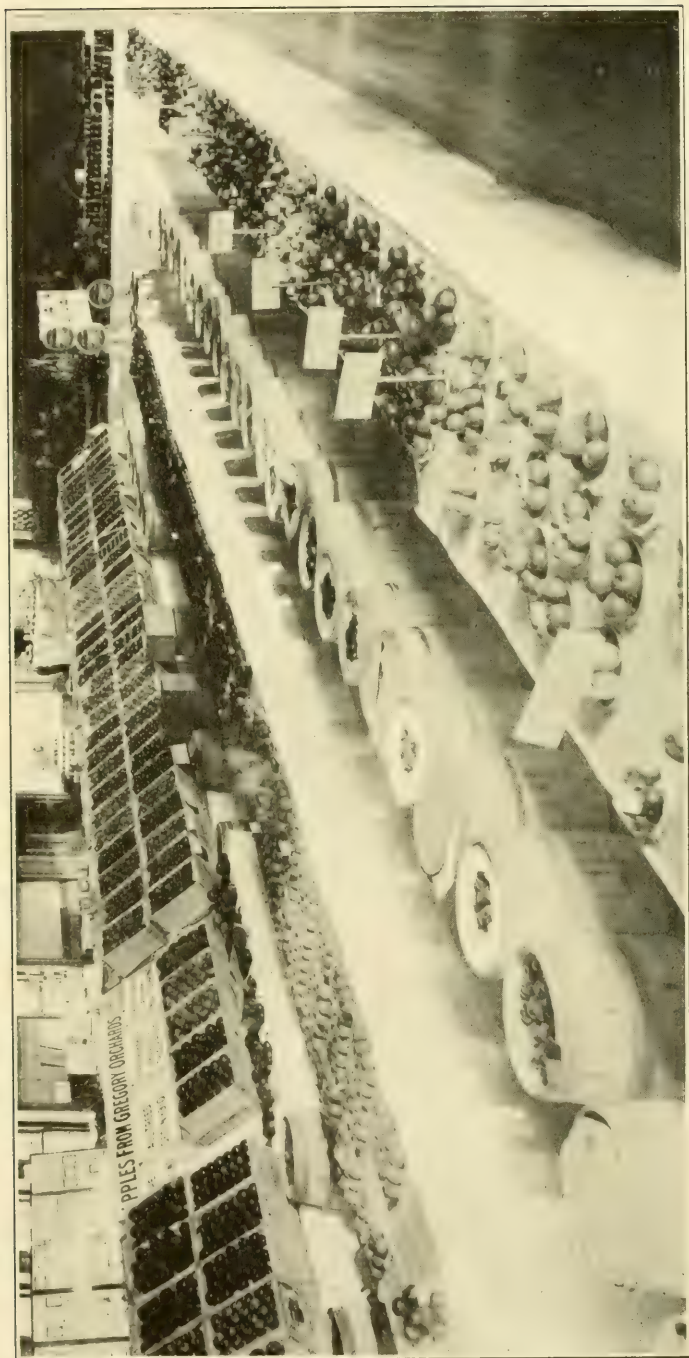
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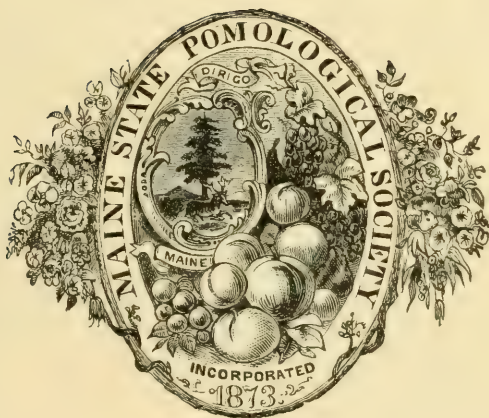
Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking up City Hall,  
with jelly and preserve exhibit in extreme end.

TRANSACTIONS

OF THE

Maine State Pomological Society

FOR THE YEAR 1914



ANNUAL EXHIBITION HELD IN BANGOR  
NOVEMBER 17, 18 and 19, 1914



## OFFICERS FOR 1914.

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Waldo County—HARRY W. LITTLEFIELD,	Brooks
Washington County—DAVID CAMPBELL,	Cherryfield
York County—C. E. FELCH,	Limerick

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# MEMBERS OF THE SOCIETY.

## LIFE MEMBERS.

Allen, W. H.	Buckfield	Knowlton, D. H.	Farmington
Andrews, Charles E.	Auburn	Lang, Ivan E.	Augusta
Atherton, Wm. P.	Hallowell	Lapham, E. A.	Pittston
Atkins, Charles G.	Bucksport	Leavitt, L. C.	Kezar Falls
Averill, David C.	Temple	Lee, Lyman K.	Foxcroft
Bailey, W. G.	Freeport	Leland, Will E.	East Sangerville
Bennoch, John E.	Orono	Lincoln, E. L.	Wayne
Bickford, Lewis I.	Dixmont Ctr.	Litchfield, J. H.	Auburn
Bisbee, George E.	Auburn	Littlefield, Harry W.	Brooks
Bisbee, Stanley	Rumford Falls	Lombard, Thurston M.	Auburn
Blaisdell, A. L.	Winterport	Lord, J. Merrill	Kezar Falls
Blossom, O. E.	Turner Center	Luce, Willis A.	Mabton, Wash.
Briggs, John	Turner	Macaulay, T. B.	Montreal, Can.
Burleigh, Miss Clara M.	Vassalboro	Martin, John J., 270 Center St.	Bangor
Burr, John	Freeport	McAllister, Zaccheus	West Lovell
Chase, Charles M.	Wiscasset	McCabe, George L.	North Bangor
Butler, Alonzo	Union	McLaughlin, Mrs. Edna G.	Exeter
Butnam, J. W.	Readfield	McLaughlin, Henry	Bangor
Chadbourn, C. L.	North Bridgton	Merrill, H. H.	Hebron
Chandler, Mrs. Lucy A.	Freeport	Merrill, Oliver F.	Gardiner
Chase, Henry M., 103 Federal St.	Portland	Merrill, Rupert B.	Gardiner
Chase, Homer N.	Auburn	Mitchell, Frederick H.	Turner
Chase, Thomas E.	Buckfield	Mitchell & Co.	Waterville
Clement & Taylor	Winthrop	Moody, Charles H.	Turner
Conant, A. A.	Hebron	Moore, William G.	Monmouth
Conant, E. E.	Hebron	Moor, F. A.	Waterville
Conant, Geo. I.	Hebron	Morse, F. H.	Waterford
Conant, H. L.	Hebron Station	Morse, W. J.	Orono
Conant, W. H.	Buckfield	Newell, G. E.	Turner
Conant, W. G.	Hebron	Page, E. E.	East Corinth
Corbett, Herman	Farmington	Page, F. W.	Augusta
Crowell, Mrs. Ella H.	Skowhegan	Palmer, George L.	Kents Hill
Crowell, John H.	Farmington	Parsons, Howard G.	Turner Center
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Dawes, S. H.	Harrison	Prince, Edward M.	West Farmington
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DeCoster, Virgil P.	Buckfield	Pulsifer, D. W.	Poland
Denison, Mrs. Cora M.	Harrison	Richards, John T.	Gardiner
DeRocher, Peter	Bradentown, Fla.	Ricker, A. S.	Turner
Dirwanger, Joseph A.	Portland	Ricker, Fred P.	Turner
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Emerson, Charles L.	South Turner	Rogers, Mrs. Jeanette	North Newburgh
Farnsworth, B. B.	Portland	Sawyer, Andrew S.	Cape Elizabeth
Felch, Chas. E.	Limerick	Saunders, Ernest	Lewiston
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Gardiner, Robert H.	Gardiner	Smith, V. N.	Buckfield
George, C. H.	Hebron	Stanley, H. O.	Winthrop
Goddard, Lewis C.	Woodfords	Staples, George W., 904 Main St.,	Hartford, Conn.
Grover, Franklin D.	Bean	Stilphen, Asbury C.	Gardiner
Gulley, Alfred G.	Storrs, Conn.	Supt. Maine Sanatorium Farm	Hebron
Hackett, E. C.	West Gloucester	Sweetser, F. R.	Cumberland Center
Hall, Mrs. H. A.	Brewer	Taylor, Miss L. L. (Lakeside)	Belgrade
Hardy, E. E.	Farmington	Thomas, William W.	Portland
Hardy, Walter M.	Brewer	Thomas, D. S.	North Auburn
Hayes, William	Gardiner	Thurston, Edwin	West Farmington
Heald, U. H.	Paris	Townsend, Mrs. B. T.	Freeport
Herrick, A. A.	Norway	True, John W.	New Gloucester
Hightings, E. F.	Orono	Twitchell, George M.	Auburn
Hoyt, Mrs. Francis	Winthrop	Vickery, James	Portland
Jackson, F. A.	Winthrop	Walker, Charles S.	Peru
Keene, Charles S.	Turner	Walker, Elmer V.	Oxford
Keyser, Howard L.	Greene		

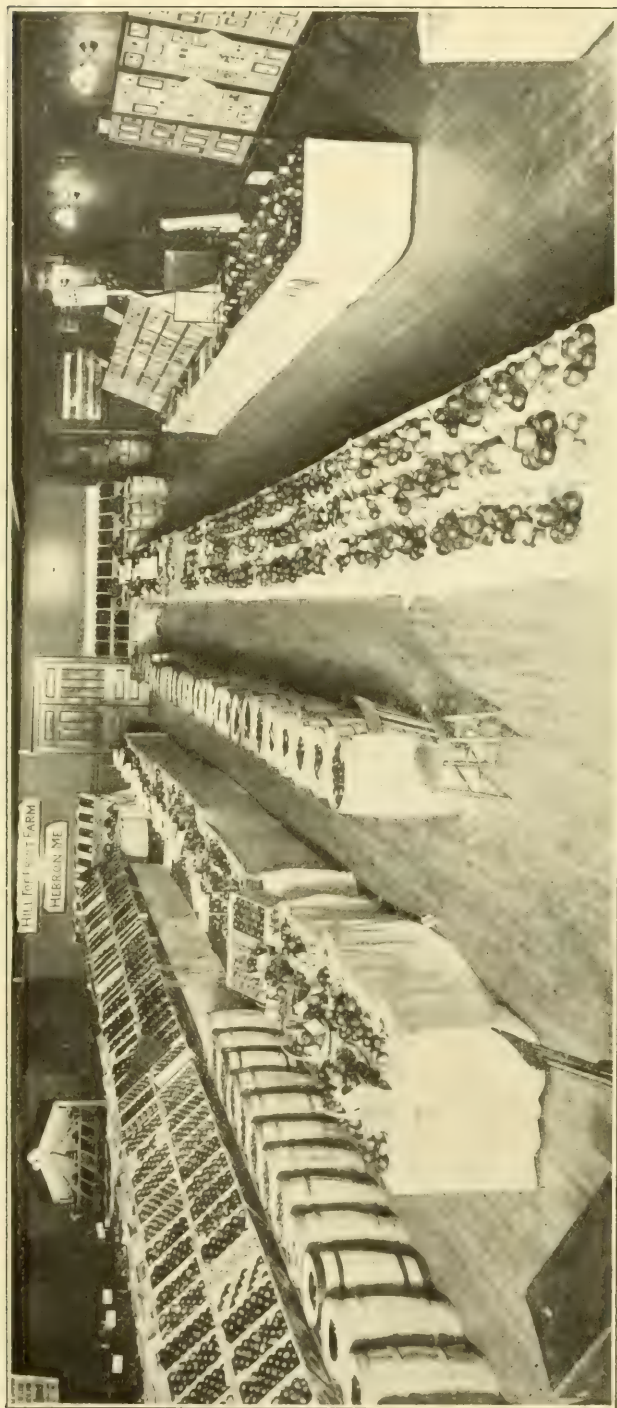
Waterman, Willard H.....	East Auburn	White, Edward L.....	Bowdoinham
Waugh, F. A.....	Amherst, Mass.	Whitman, L. E.....	Hebron
Weston, Joseph.....	Gardiner	Woods, Charles D.....	Orono
Wheeler, Charles E.....	Chesterville	Wright, Frederick.....	Bath
White, Charles M.....	Bowdoinham	Yeaton, George A.....	Augusta
White, Mrs. Annie.....	Bowdoinham	Yeaton, Samuel F.....	West Farmington

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Adkins, F. E.....	Livermore Falls	Jones, George T.....	Fairfield Center
Bartlett, E. N.....	Monroe	Jordan, Ira.....	Milbridge
Bartlett, E. W.....	Pittsfield	Kimball, F. H.....	Waterboro
Bass, Lizzie E.....	Wilton	Lee, Lyman K.....	Foxcroft
Bass, Mary A.....	Wilton	Libby, Miss Julia M.....	Hartland
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Cleaves, William W.....	West Sangerville	Putnam, J. H.....	Litchfield, Conn.
Clements, Charles E.....	Winterport	Reed, R. C.....	Temple
Clements, E. H.....	Winterport	Redman, R. W.....	Orono
Clements, R. L., R. F. D. 3.....	Monroe	Reilley, Wm. J.....	Dansville, N. Y.
Conant, Charles M.....	Winterport	Ridley, Charles.....	Oakland
Conant, W. H.....	Buckfield	Rines, J. Henry.....	Portland
Cressey, E. B.....	Standish	Roberts, Alfred G., R. F. D. 1.....	Alfred
Deering, A. L.....	Augusta	Roberts, John A.....	Norway
Dickey, Miss E. A.....	Greene	Robinson, Mrs. J. I.....	Exeter Mills
Dillingham, Charles A., R. F. D. 8.....	Bangor	Scott, John, 262 Kenduskeag Ave.....	Bangor
Dolley, Walter.....	Old Orchard	Shaw, Ralph W. E.....	Sebago Lake
Dolloff, E. W.....	Standish	Sturtevant, Ernest F., 95 Park Ave.....	Auburn
Dolloff, H. W.....	Standish	Sturtevant, F. D.....	Hebron
Dresser, Walter H.....	Standish	Sweetser, H. P.....	Cumberland Center
Elder, George K.....	Lewiston	Tainter, Albert W.....	Dixfield
Erskine, George B.....	Jefferson	Tibbetts, T. E.....	Exeter
Gleason, Fred A.....	Union	Varney, Clark E.....	Kezar Falls
Graham, John R.....	Bangor	Verbeck, R. H.....	Kezar Falls
Guptill, Mrs. W. T.....	Topsham	Vigue, C. H., 15 Silver St.....	Waterville
William, George T.....	Mechanic Falls	Warren, Constance, 639 Lexington Ave.,	New York City
Haines, Wm. T.....	Waterville	Waterhouse, W. H.....	Old Town
Hetherington, John, R. F. D. 37,	Waterville	Wyman, P. M.....	West Paris
Hinds, W. C.....	Winthrop	Yeaton, George A.....	Norway
Hodgdon, Fred.....	Buckfield	York, George H., R. F. D. 3.....	Monroe
Ingraham, William W.....	Portland		
Irish, Dr. I. C.....	Bowdoinham		







Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking down the right side of City Hall.

ANNUAL MEETING  
OF  
MAINE STATE POMOLOGICAL SOCIETY

BANGOR, NOV. 17, 18 AND 19, 1914.

---

TUESDAY EVENING, NOVEMBER 17.

Music.

Prayer.

Music.

ADDRESS OF WELCOME.

HON. J. G. UTTERBACK, Mayor of Bangor.

*Mr. President, Ladies and Gentlemen:*

It is indeed a pleasure to greet you and to extend to you on behalf of the citizens of Bangor and the Bangor Chamber of Commerce a hearty welcome to our city. It has been, and shall be, our earnest endeavor so to play the part of host that you will all carry with you a pleasant recollection of your visit in Bangor.

We of Bangor believe that Bangor is the logical convention city of the State of Maine, situated as we are in the center of the state, and being near the center of population, possessed of the very best hotels in the state and also of the very best of shopping facilities. We are glad to have you with us. A convention of this sort, bringing to us the representative people of the various sections of the state, is certainly an inspiration to all of us, and we in Bangor benefit, and we believe that you derive on your part a benefit, particularly from the coöperation and intermingling of ideas. Certainly every one who in any way takes part in a gathering of this sort derives a benefit. And I am sure that every one present tonight, particularly those who come without any real idea as to the nature, or rather as to the extent, of this exhibit, is certainly delighted beyond measure to know that the state of Maine can produce an exhibit of this sort. A very short time ago I was talking with a gentleman who has been a member of the Western New York

Fruit Growers' Association, an association comprising over 1,400 members. This gentleman has attended many of their exhibits in Rochester and he says that never at any exhibit there has been seen such a splendid display of fruit as he sees here tonight.

I believe firmly in the future growth and development of the State of Maine. I believe that there is no state in the Union today making more rapid progress in commercial, industrial and agricultural lines than in Maine. But in order to promote this advancement in which we are all so interested, we need more coöperation on the part of all of us. Surely we cannot accomplish things unless we all get together with the firm determination of making Maine stand where she should.

Now the Bangor Chamber of Commerce has a slogan, and it is "Boom Maine by eating Maine apples." That is a splendid slogan, and particularly so to the State Pomological Society, and I believe it is one that should be carried further than this convention.

We are glad to have you here with us. We hope that your deliberations will be beneficial, and that you will carry away with you a pleasing impression of Bangor.

#### RESPONSE.

By DR. LEON S. MERRILL, University of Maine.

*Mr. President, Ladies and Gentlemen:*

I do not know that I ever approached a duty with greater embarrassment than the present one,—first, because this is one of the occasions when a man ought to be able to say just the right thing; second, because of lack of sufficient time to prepare myself for the task; third, because to properly express our appreciation for the happy circumstances surrounding this occasion is difficult. But we sincerely hope, Mr. Mayor, that the program we have prepared, and this splendid exhibit of the fruits of the farms of Maine now displayed before us, and the general manifestation of pleasure and happiness by those in attendance, will convey to you and to the gentlemen of the Chamber of Commerce in terms far more definite and emphatic than any which I may give expression to, our appreciation of your interest in the industry we represent, the assistance you have given to make this meeting a success, and the plans you

have made for our happiness and comfort during our stay in Bangor. It is always pleasant to be assured that you are welcome, and the words of his Honor, the Mayor, leave no chance for us to doubt that we are among friends. All this gives us a feeling of comfort and content, and we are now prepared under these very favorable circumstances to proceed with the business of this meeting.

It would, I think, be out of place for me to attempt any extended address. Hence my remarks will be confined to a very brief and general statement concerning the Pomological Society and its function, and its relation to the agriculture of the state. With the exception of the Grange, I think the Pomological Society is the oldest and largest farmers' organization in our state. Its function is the development of the fruit industry of Maine. It does this by means of its annual exhibits and its educational and promotion programs. It also takes an active interest in the protection of the industry and it has had no small share in shaping and securing the legislative acts now upon our statute books concerning the fruit industry. I think it can be truly said that the Pomological Society is one of the most influential factors in Maine agriculture today, that it is aggressive and progressive in its efforts to secure every improvement to the agricultural interests of Maine. It is always supporting every move that is likely to bring about encouragement and improvement in our agricultural interests. I think it would need but just a glance about this hall tonight to convince you that the fruit industries of Maine, at least, are developing. Maine has already approximately forty-two per cent of all the apple trees of bearing age in New England, and at least fifty per cent of all the trees of non-bearing age. Maine can therefore well claim to be the leading fruit growing state of the northeast group of states. She has large areas of soil well adapted to fruit growing. It is unnecessary for me to enlarge upon this fact or to explain the reasons therefor, since they are quite generally known to Maine people and therefore need no elaboration. That this adaptation is being taken advantage of more and more each year is a source of pride to this association. We are glad to see the development of the fruit industry go on, because of its effect upon the agriculture of the state and upon the men and the women who are engaged in fruit-growing. My



appreciation and my understanding of the fruit grower has considerably enlarged during the past few years and I have come to look upon him as a tremendously important factor in the development of the agricultural interests of our state. I would like to bring perhaps more definitely from my notes than I could speaking extemporaneously, my impression of the modern fruit grower.

The modern fruit grower is progressive. He adopts new ideals readily. He keeps in touch with the results of experiments conducted by the experiment stations, and therefore with the up-to-date methods in fruit growing. He tests out the new ideas on his own farm, and his knowledge and understanding of the business enlarges correspondingly. The artistic temperament of the farmer is developed and along with it his appreciation of all that is best in all kinds and types of farms. The reaction of fruit growing upon the farmer is therefore to make him studious, thoughtful, appreciative and progressive, and these qualities are reflected in his attitude toward education, and especially toward agricultural education, toward scientific investigation, business organization and management of the farm, improved roads, co-operative buying and selling associations, and community spirit and pride. The reaction upon agriculture generally is educational, inspiring and elevating.

But, my friends, the growing of fruit in abundance is not enough to secure agricultural prosperity. The elimination of waste in the production of fruit and the constant improvement in quality even are not enough to guarantee a living profit to the fruit-grower. Fruit once grown has to be sold. To do this requires some machinery of distribution. And somehow that machinery of distribution appears to most of us to be complex, and at some points wasteful and even extravagant in operation. It is well to note that this machinery is not operated by the man who grows the fruit or by the person who consumes it. It is, on the other hand, controlled by that person who has no other interest in the industry except to take a price at every turn of every wheel in the machinery of distribution. This fact is now pretty well known. And I think it is only fair to state that the distributor, or at least some distributors at some points in the machinery of distribution, stand today indicted before the bar of public opinion with the offence of wasteful methods in dis-

tribution and exorbitant profits. Some of us feel that business men and business men's organizations might help this situation. If not, then the farmer must organize his own machinery of distribution for the handling of this important product of the farm. And it is a source of congratulation to the farmers of Maine that this movement has begun. It was a very happy thought last year, my friends, when the members of this society elected as its president, the president of the first fruit growers' association in Maine engaged in the business of distributing their own product. We are looking very hopefully to that association and to others that have been organized since. In closing, I will say that we certainly appreciate the courtesies already extended and the plans that have been made for our comfort during the few days we shall remain in this city as her guests, and I hope that the effect of this meeting upon the fruit industry of this section of the state will be immediate, helpful and lasting.

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## OUR FRIENDS THE BIRDS.

DR. EDWARD HOWE FORBUSH, State Ornithologist, Boston, Mass.

(Illustrated Lecture.)

Recent agitation for the protection of birds has resulted in bringing home to the people the fact that birds are of some service to mankind. Many people have absorbed the idea that birds were created to protect man's gardens, trees and crops from insect pests. This is not the fact. When birds were created there were no shade trees, no orchards, and no gardens to be protected from such pests. The relations of birds, insects, and other forms of animal life are not quite so simple as this belief would indicate. No man is wise enough to understand fully the marvelous interrelations and interdependencies existing between the various forms of animal life, but we know that there exist between vegetation, insects, birds, and other animals, what may be termed primeval economic relations, a sort of dependence one upon another. The existence of each one, and the place that it fills in the economy of nature, depend largely upon the existence of the others and the fulfilment of

their functions. Therefore the undue increase of any one form of vegetable or animal life is prevented by others which feed upon it.

Birds, because of their telescopic vision and their great powers of flight, fill a place in this great plan which can be filled by no other form of animal life. They perform the functions of an aerial police force, being better able than any other class of animals to concentrate quickly from wide areas upon any unusual destructive outbreak of insects or other animal pests, and reduce it. Such an influence, working on destructive or potentially destructive pests, must have a beneficent relation to agricultural industries, and it is in this way that birds help us. Birds have a marvelous capacity for destroying pests. They are wonderfully active, and tremendously energetic. Their circulation, respiration and digestion are remarkably rapid, for the constant wasting of the tissues calls for exceedingly rapid renewal. Constant fuel is required to keep the vital fires burning brightly. Hence, birds require an enormous amount of food.

Audubon tells us that a woodcock will consume its own weight in earth worms in one night. This seems rather a large story, but my friend, Herbert K. Job, caught a woodcock and kept it for some time, and he found by experimenting with that bird that in twenty-four hours it ate twice its own weight in earthworms. That seems like a remarkable story, but many years ago Professor Treadwell, of the Boston Society of Natural History, procured, for experimental purposes, some young robins fully fledged and just ready to fly. He fed the little birds all he thought was good for them, but at the end of a few days one of them died, and upon examination he found that it had starved to death. Upon this, he fed the survivors more and more until they had all that they seemed to require, and he found that each one of these young birds needed about 65 per cent more than its own weight in solid beef every day, or fourteen feet in length of caterpillars or earthworms. Many experiments of this kind have been made since then and they fully corroborate those of Professor Treadwell. If a man were to consume food in that proportion, he would eat in one day 67 feet of bologna sausage three inches in diameter.

From the hatching of the young of our insectivorous birds until the hour of flight, is only from one to three or four weeks, and in that brief period the birds must grow to nearly the size of the parents and must develop all organs, muscles, bones and functions, and at the same time grow long flight feathers to enable them to wing their way through the air. Hence the necessity for the enormous amount of animal or insect food which best serves to promote such bone, flesh and feather growth. The parent birds, because of their activity, require nearly as much food as the young. Therefore the birds of a township, a county, or a state, must consume enormous quantities of insects, most of which are injurious or potentially injurious.

Reed estimates that the birds of Massachusetts consume 2,560,000,000 insects or 21,000 bushels each day. I believe that Professor Lawrence Bruner estimates that the birds of Nebraska, a much larger state, eat 170 carloads daily. Birds have tremendous appetites, and we can easily see why they do so much good when feeding on our insect foes, and so much harm when feeding on our fruit crops, but it is interesting to note that we can count upon the fingers of one hand practically all the birds in Maine that are really injurious to the agriculturist.

The services of birds to mankind are of greater value in field or forest than in orchard or garden. Birds cannot nest in the garden, as the operations of tillage drive them out, and unless you have trees, shrubbery and vines in which the birds can nest you do not get so much benefit from them in the garden. Nevertheless, the swallows and the night hawks and other birds which take their food in flight come in and eat insects that otherwise would destroy crops, and birds like the robin are very useful in the garden because they dig into the ground and eat white grubs, wire worms, and other insects that destroy the roots of plants.

We can use insecticides and other means to control insect pests in the garden or orchard, but we cannot spray with poisons all the trees in all our woods, and we cannot drench with insecticides the grass that our horses and cattle eat. Therefore we are absolutely dependent upon the birds and other natural enemies of insects to protect the forest trees and the grass crops and pastures of the country from any undue increase of insect pests. Wherever birds exist in sufficient numbers, they perform their



office well, except where some foreign pest has been introduced which they are not accustomed to.

Chipping sparrows are very useful in the garden because they feed on the insects that destroy the low growing crops, and they also eat the seeds of weeds. The Department of Agriculture tells us that the native sparrows of the United States save the farmers of this country \$35,000,000 a year by destroying weed seeds. I do not know how they figure that out, for it seems to me that weeds are a benefit to the farmer in one way because they keep him tilling the soil,—but that is the way they figure it, and birds destroy enormous numbers of the seeds of weeds.

The song sparrow, which feeds on the insects of the low ground, such as the cabbage plant lice and cabbage worms, is a little bird which sings almost the year round, either north or south. It is well named the song sparrow.

I suppose that if you orchardists had enough chebecs in your orchards you would not have any railroaded apples, because this little flycatcher, so Prof. Hodge says, eats the fly, the parent of the railroad worm. If we could only attract these little birds into our orchards, we should have less trouble with the railroad worm. Any birds which eat fruit worms are useful in the orchard. We find that many birds in the orchard eat insects which you cannot destroy by ordinary arsenical spraying.

It is an interesting sight to see a vireo feeding her young. These young when recently hatched are naked and blind and know only enough to hold up their mouths and open them for food. And the mother bird swallows insects and partly digests them in her stomach or gullet and then regurgitates them or throws them up into the mouths of the young. She forces her bill right down into the throat of the young bird. You may see a pine warbler feeding her full fledged young. She feeds it with full grown insects often alive. She usually forces them well down into the throat, and if she does not, sometimes the insects get away. I remember seeing a large hairy caterpillar crawl out of the throat of a young bird.

I suppose that there is no help for the grass in the fields unless we have the birds and the other enemies of insects there, for we cannot spray with poisonous insecticides the grass that we must cut for hay. Therefore we must depend on these birds,



and the meadow lark with young in the nest is worth four or five dollars a year to the farmer because of the grass-eating insects which the little family consumes. All the birds of the field are beneficial in the same way. They feed on the insects which destroy the grass, and were it not for these birds you would soon have no grass crop. Let me give you evidence in support of this statement. Whenever I speak to farmers about the crow, every time I open my mouth I put my foot in it, for no matter what I say they disagree with me. I know of one old farmer who got up in a meeting of the Massachusetts State Board of Agriculture and asked that a bounty be put on crows. Some one said, "If you put a bounty on crows in this state, they will bring dead ones in from other states and collect bounty on them." The farmer said, "That would be a blessing. Kill them all! I would like to wring the neck of the last crow in Massachusetts." Many feel like that, but the crow is a necessary evil. In the decade of 1740-50 in all the New England colonies bounties were paid on crows by every town clerk, and crows and blackbirds were so slaughtered that by the year 1749 they were nearly all gone. Then a grass famine occurred and the farmers of Massachusetts and Maine and all these New England colonies had to send to England and Pennsylvania to get hay enough to carry their cattle through the winter, because, as the people believed, the cut worms, grasshoppers, locusts and other grass insects increased so much as a consequence of the destruction of these birds. There never has been a general bounty paid on crows since. If the crow is doing harm kill him, if you can, but do not exterminate the crow.

I believe that birds are just as necessary in the woods as they are in the fields. I have lived eight years of my life in the woods and have watched the birds night and morning, spring and summer, fall and winter and if you could see what I have seen it would surprise you. I have seen a scarlet tanager come to a bush and take every caterpillar off it. I have seen a little flock of kinglets come to a pine grove, stay there all winter, and clean off the eggs of the plant lice from those trees so that no plant lice could be seen the next year. Many other things of that kind I have seen,—birds coming in the spring and staying until the fall and destroying all kinds of destructive tree insects. Where the birds have been killed off the trees have been stripped

of their leaves by insects, the borers have gotten in and the trees have died. Trees are particularly essential in a mountainous country. I want to tell you of what happened in Northern China, where the people killed the birds and destroyed the trees. The people became so numerous there that they killed the game and the birds and cut down the trees, and by and by there were no trees left; and they even dug up the roots of the trees. As the trees died they cut them down and dug out the roots. Then it came on winter and spring and the rain poured down on those bare mountains as it rains on the roof of a house. As it ran off, it tore the soil from the mountains and carried it into the valleys, and the floods came and carried that soil down the valleys to the sea. And today no man, no animal, no plant, can live there. The continual floods and the continual denudation of the country has absolutely ruined it, and there in those valleys you see the ruins of great cities. A land where formerly a numerous population existed is today a desert because they destroyed the trees and destroyed the birds.

In passing I must say a word about so-called hawks, real hawks and owls. The night-hawk, so-called, is not really a night bird,—it flies in the daytime also and is not a hawk at all. It has a small weak bill. It could not kill a bird and its feet are very weak. Its main feature is its mouth, and next its stomach. It has a great mouth and a great stomach. The mouth opens back to the ears. Professor Harvey, I believe, found 500 mosquitoes in the stomach of a night-hawk. The mosquitoes and the flies that birds eat are very dangerous, especially in the south, carrying the germs of yellow fever, typhoid, and other diseases. Still, we kill these birds. No one should ever shoot a night-hawk. There is a real hawk that is one of the most beneficial birds,—the rough-legged hawk. I do not mean to say that all hawks are beneficial. Some are destructive. But this one has almost never been known to kill a bird. I think the first record of that sort was noted last year, when some of these hawks in the west killed meadow larks. They feed on animals mainly, on field mice, etc. Now do you know what would happen if these field mice were not held in check by hawks and owls and birds of that order which continually hunt them? Every pair of these little mice will produce from twenty to thirty young every year. Just think for a moment. Figure out and

see what it would come to in a few years if these animals were not held in check.

Wherever the hawks and owls have been entirely killed off field mice have increased so that they have eaten up everything green on the face of the earth, taken away the pasturage of the cattle and left the country without a green thing in it. And there is no hope and no help for such an irruption of mice as that until a flight of hawks and owls comes along and cleans them up.

The owls are the target of ignorance and superstition and have been since the dawn of history, but among them are some of the most useful of birds. Our two large owls, the Barred Owl and the Great Horned Owl, however, kill some game and poultry. I will tell you more about the smaller owls later.

The spotted sandpiper, a very useful bird, is one which we should never kill, because it feeds on insects in the grass, the corn field and the cabbage field. At the present time they are protected by a national law, but up to within a few years people have been allowed to shoot them most of the year; even in the summer when the little young birds were running about unable to fly, in most of the states the law has allowed the gunner to kill them.

The sandpipers or peeps of the seashore are also useful to the western farmer, feeding especially on grass insects in the interior. In the fall they go south, along the Atlantic coast.

The smaller herons are not very handsome but are useful. They feed on fish and the insects of the low ground, such as the low land grasshoppers and the army worm, which if they are not held in check will march into the uplands and destroy the crops, as they have all over the eastern country largely this year. Dr. Gaumer tells us that all along the coast of Yucatan and Mexico, where herons and other littoral birds have been killed off, disease has increased among the inhabitants. No one knows why, but some people believe it is because these birds, which were killed for millinery purposes, formerly fed on the larvæ of the yellow fever and malarial mosquitoes and so saved the inhabitants from a certain amount of disease.

The gulls of the seashore are scavengers. They pick up dead fish and decaying matter along the shore, and the garbage that is thrown out, and keep it from floating in on the beaches. The

Mormons in Salt Lake City have recently erected a monument costing \$40,000, to the sea gulls, because they saved the early Mormon settlers from starvation by killing off the crickets which destroyed their first crops.

The passenger pigeons, the wild pigeons so-called, blew across this country at one time in greater numbers than any other living species. No birds in the world, so far as we know, were ever so numerous on their nesting grounds and roosting grounds, as these pigeons. Many millions of them nested in certain localities, some in Maine, and all through our northern United States. They nested or roosted there in the summer and went south in the winter, and they have been destroyed at all times of year without any regard to law. Thirteen millions were sent from one town in Michigan in two years to the market; vessels were loaded in bulk with them. I have seen them on North Market Street in Boston in barrels standing the whole length of the street. And today they are gone, absolutely destroyed by the market demand. Therefore we must stop to a certain extent the marketing of wild birds in this way.

There is another way in which birds have been exterminated and that is the killing of them for ornamental purposes, for the ladies' hats. Thirty years ago it was fashionable to wear terns or sea swallows on bonnets. There was no law enforced against it and hunters came to the islands on the Maine coast where the birds breed and shot them as they flew over. If one fell down and cried out the others came about and the gunner shot them all and left the little young birds to starve in the nests. That is the way the ladies got their feathers! Ladies, you do not need these feathers; you are lovely enough without them.

Just a word about how we are trying to protect these sea birds now. It should interest you people here in Maine because you have some of the finest bird colonies in the world on your coast. Right off your coast are the bird islands. The Audubon societies are trying to protect these birds by appointing as wardens lighthouse keepers and others up and down the coast to watch and protect them. Last summer I spent a little time on Duck Island, near Mt. Desert, where there is a fine colony of Herring gulls, which are there now in great numbers and very tame because they are not hunted and molested. I have seen the lighthouse keeper feed them by hand. Today in almost every one of these



colonies, wherever the little young birds are growing up, somebody is looking out for them and protecting them. And so we have increased these birds of our own sea coast here, on the Gulf of Mexico, on the Pacific coast, on many lakes in the west, and everywhere where they are breeding in colonies. Thirty years ago there were only about a dozen or twenty pairs of Laughing Gulls left in New England. They were on Muskeget Island. A warden was put on that island every year during the breeding season to protect them. Today, thousands are there, and they have scattered along the coast from Massachusetts to Maine. Mrs. Russell Sage has recently established a large reservation of this kind in Louisiana, for water birds and land birds. The Rockefeller Foundation has established another, and these reservations will in the end be the salvation of the birds.

There is another danger that menaces our small birds and it is the foreigners that come from other shores, who kill birds in their own countries. Here they destroy some of our most beautiful and useful birds. We welcome those people. They must come here to do our work, but we must try to teach them not to kill our small birds. In the south both blacks and whites kill small birds. Three years ago I was in South Carolina and I watched a dozen colored men shooting bobolinks and other small birds. At noon they came and sat on a levee or dike as they called it and ate their lunch, and I went there and asked them how many birds they had. They laid out their burlap bags in which the birds were kept and counted them out by the dozen, and if their count was correct, they had killed over a thousand of those birds that forenoon. These birds come in great flocks and they are supposed to be killed because they eat rice. But there the rice culture is going out. It is almost extinct and these birds are not killed for that purpose at all but for the twenty-five cents that the blacks get for the birds and for the sixty or seventy cents which the whites get when they sell them again. That is the reason they are shot today in the south and that same sort of thing has been going on all over the south. We have now a law—a Federal law—for the protection of migratory birds, which, if we can enforce it, will eventually do away with the most of this shooting.

Now, having given you some idea of the public means we are taking to protect our birds, let me approach the most interesting



task before us. That is the protection by the individual of the birds about our farms and homes, and the way to go about it. A short time ago in the west a magazine offered a prize for a paper on how to keep the affections of a husband. The papers offered in the competition were not to contain over a thousand words each. The paper that took the prize had only three words, "Feed the Brute." Now if you can find the way to a man's heart by his stomach, perhaps you can get a good deal nearer a bird in that way. Birds need shelter, protection and food, and to be made to feel at home.

On the north side of my house at Wareham is a thicket facing to the south, shutting off the cold wind, and there are some brush heaps. If I wanted to attract birds to my front yard I would have a brush heap in it. You may have a few bushes and vines to cover and screen it. That would help, and you can throw food under the brush heap, and there is a refuge for the birds, where they can fly from the cat or the hawk and if it is covered with pine boughs in winter that will keep the snow out and make a refuge the year round. My eldest boy thought he would like to have a feeding station for birds. This was long before we had feeding stations as we do now, and he put out an open dry goods box lying on its side with the opening to the south, threw a little chaff in it, put it up next to the thicket and then gradually every day moved it up nearer and nearer the house, so by and by we had it right under the windows. And the birds began to come; sometimes sixty or eighty birds could be seen around that box in the winter, juncos and quail, and we had nearly all the seed eating birds that can be found here in winter, around that box or on the trees near the house at one time or another.

From the windows on the other side of the house the children threw out some Japanese millet. All our seed eating birds like Japanese millet, so they were attracted to the house. In the fall, not waiting until winter, we took bones from the kettle and tied them on the trees at some distance from the house. What I want to show you here is this,—that it will not cost much money to attract the birds. It can be done without the expenditure of a dollar. Of course you can buy suet and meat trimmings, but refuse meat or fat is all that is necessary to attract insect eating birds.

Later our old friend the scarecrow was brought up from the grain field as a sort of under-study for me. It was put up out doors near a kitchen window with some beef scraps or suet on its hand. My little girl said, "Now you don't really believe those birds are going to mistake that scarecrow for a man?" "No," I said, "but when I get out there made up the same way, I expect they will mistake me for the scarecrow." And when I had got them coming to the side and to the hand of that scarecrow and on his shoulder, I went out and put on that coat and hat and put out my hand and the little chickadees came and fed from my hand. If you ever have a little bird come and alight in the middle of your hand, I am sure you will want to protect those birds, and children, when they find a bird will come to the hand, will never think of injuring one. It is a good thing for the bird and a good thing for the children, and much better for the children than for the birds.

My youngest boy, who likes to draw birds, thought he would like to have the birds right at the window so that he could sit in the warm room and draw them. So he put little bits of suet and meat on a bush, which he fastened up outside on the window sill, and the chickadees, jays, nuthatches and woodpeckers came, and by and by he could sit there and draw all the birds at the window without any trouble at all. He could put his face right up to the window and they were not afraid of him. They had got accustomed to him and knew him perfectly well. My book, "Useful Birds and Their Protection," tells the story, and if any of you would like to pursue the subject further you can get the book from the State Board of Agriculture at Boston, in the State House; and I want to say that I feel at liberty to advertise it because I make no money on it. It is sold by the state at cost. It is a book of 500 pages with many illustrations, and is sold for \$1.00.

A little more about this bush. Early in the morning one might see the downy woodpecker climbing the bush. His climbing tools work only one way. He has to go up forward and down backward, like the bear. But the nuthatch the children used to call the little upside down bird. It was just as happy wrong side up as right side up. A pair of these birds got so used to our house and so much pleased with it that they undertook to find a nesting place on it or in it, and the little female bird got

into a window upstairs and there she fluttered away at the wrong window, trying to get out, when nobody was looking, until she died, and the little male stayed around there for a week or two apparently mourning for his mate. These birds became so tame we had to keep our windows closed if we wanted to keep them out of the house.

My oldest boy wanted a birds' Christmas tree. He had heard how the Norwegians put a sheaf of grain on the roof of the barn for the birds at Christmas time, and so he put up a shelf outside a window with a little pine tree on it, putting little bits of meat or suet on the tree, and putting some chaff on the shelf and a little seed or grain. On a cold snowy morning all he had to do was to push the snow off, and the birds came, and soon we had birds galore. We also put up nesting boxes for the birds around the house in different places all winter. We put hay or cotton in them because the chickadees, nuthatches and woodpeckers like to find some place where they can keep their toes warm on winter nights, and we found in some cases they used these boxes; also, the chickadees used them. Then they nested in one in the spring.

Many birds are attracted to a window shelf of this kind and sometimes the shelf will be crowded. My friend Bowdish has a photograph of purple finches on his window shelf and sometimes he has had twenty-two or twenty-three birds of the same kind on the shelf, and often we had about that number of birds. It is simply a matter of a little care and absolutely no cost to attract these birds around your house where you can protect them.

Now we come to bird houses. Nowadays in our country we so trim our trees that the natural cavities in which birds nest are nearly all destroyed, and it is a good plan to put out nesting boxes for the birds. If you put them out in the right way you get the birds,—without question you will get them. It is not necessary to have a great ornamental martin house, although that is a fine thing for the purple martin; but anything will do that is near the right size and the entrance hole about right. A barrel with a zinc roof and some boxes inside for the birds to nest in makes a good cheap martin house. A common box was taken by a bluebird at once because it was the right size and the hole was an inch and a half in diameter and it was put up in

the right place. The roof should project out over the opening to keep the snow and rain from getting in. A perch is not necessary, but some birds like it. And then the box may be deep enough so that the cats cannot very easily claw the young birds out. They have a habit of doing that.

It is most interesting to have a bird house so situated that you can watch the home life of the birds. That is what we call the observation box, which I have used for about forty years. We had such a nesting box at Wareham. This box is set on a sill of an upper window. Looking from the window out you see a door opening down on to the window sill and behind the door a pane of glass is set; then there is a roof which fits over to shade the entrance hole, which is made an inch and a quarter in diameter for the chickadee. We put a little meat or suet or something of that sort during the winter on the window sill, and in the spring my little girl came to me and said, "A pair of little birds, chickadees I think, are carrying sticks and feathers and things into that box." "Now," I said, "you watch those birds and wait day after day until you see them carrying in insects or anything like bugs; then you can open the box." Never was any box watched more closely than that, and by and by, two or three weeks later, she came to me in great excitement and said, "They are carrying in bugs." Then we opened the box and saw the nest with five little young birds in it. After we had watched them for a long time, we came one day to photograph them. The little ones were about ready to fly and as soon as we opened the glass one of them felt the fresh air and away he flew, right into a pear tree and the others commenced to fly out. Four of them alighted upon me, and then the father bird came to the roof and the mother bird to my hat and they talked and coaxed until away the little birds went. We did not get that picture because we were short of plates. Later we caught these little ones and put them on a stick but we could not make them stay to have their pictures taken for when we got four on it seemed that about five would fly off. We finally gave it up and took the only two that would stay.

I have said that almost anything will make a bird house. We used a lot of old tin cans. These were all bird houses, used by a bird or squirrel except an old tin teakettle. They did not seem to care for that, or else it was put in the wrong place. A



tomato can will do, with a hole cut the right size and the edges turned down, and a little hole in the bottom so the rain will run out. A box was picked up back of the barn and a hole cut in it for the bluebird, and the bluebird took it the next day.

Then we made an owl box, and I will have to tell you something about these owls. I went out one day in the grove on the south side of my house, a pine grove about sixty years old, and I picked up 16 elongated balls of fur. I took them into the house and showed them to my prospective son-in-law, and asked him what they were. He said, "Those are mice croquettes a la owl." He had been studying biology in Clark University, and he knew what they were, but you would not find much nourishment in those croquettes. I once had a young owl which I kept for a while in a cage. He was a very modest owl. He would never eat when any one was looking, but if you put a rat, alive or dead, into his cage, and went away for a minute or two, and then came back, you would find him standing up on his hind legs just the same, with the rat's tail hanging out of the left side of his mouth. I always thought that owl was left handed. The owls do not chew up rats and mice. They do not Fletcherize at all. They tear the food to pieces if necessary; but they swallow it whole if they can and then the stomach takes the little animal and digests all the soft parts complete and clean, polishes up the bones even, and then the stomach takes the bones and the fur and winds them around, the fur outside, and the whole thing is thrown up out of the mouth. That is what I found on the ground. We found in those little balls of fur the remains of thirty-four of the mice that eat the bark of our fruit trees, and I said, "We must keep owls here." So we put a box up in the grove and the very next night there was a little screech owl in the entrance. The owls kept coming, and going in and out of the box, until they finally disappeared. One day I climbed up and looked in and there was the nest all built and the mother bird sitting on her eggs. We left the nest alone until the eggs were hatched, and then we could do anything we pleased with those owls. We could take the box down from the tree with a claw hammer and screw driver, nail it up on another tree in the sunlight, take the whole front off, take any picture we liked, and then put the front on and nail it up again. First we saw the mother bird sitting on the bunch of little downy



young which looked like little chickens with hooked beaks. Later the young had a little gray coming in the white plumage, and still later, when ready to go out into the world, they were gray all over. All that summer those owls stayed there. They killed only one or two small birds. They killed several bluejays and quantities of mice and noxious insects, and the next year we had more small birds than ever before. The mice formerly had destroyed the birds, so by killing bluejays and mice these owls kept the enemies of the small birds away from them to a certain extent. So long as we kept those owls we never had a fruit tree troubled by mice.

I went down to a neighbor's one day and he said to me, "A pair of chickadees are looking my house all over. What do you think they want." "O," I said, "probably they were reared in a nesting box at my house, and they are looking for a bird house here." I went to the dump and picked up a two quart tin can and made it ready and put it in the tree, and these chickadees took it in twenty minutes. Later my neighbor put up other cans and they were all used sooner or later by birds or squirrels. There was in a little box a chickadee's nest at my kitchen window made entirely of cotton that we put in. The birds merely dug a hole in the cotton, put in one feather and there was the nest; and soon the mother bird was sitting on the eggs. I think those little birds took as much interest in our housekeeping as we did in theirs, for they watched the dish washing and everything of that sort for a long time every day. Now, what I want to call your attention to is this: By putting up boxes we increased those chickadees so that where the first year we had one nest and one brood of five, the third year we had three nests and two broods in each nest, with from seven to nine in each brood. And the result on the trees was something remarkable. We did not have to spray our trees about the house for ten years while we protected the birds there. People will tell you that the birds will not eat the hairy caterpillars. We rarely found many caterpillar nests through our orchard. One year there was one left and we thought the birds were not going to take it but the last time I saw it, when I thought I would take it off, I went to lunch and when I came back it was torn open. The birds had taken the caterpillars out and they were nearly all dead on the ground or eaten. The birds kill a good many by

tearing out a portion of the inside and eating it. But you must have birds enough, or they will not do that.

Now we come to the birds of the woods. There is a log cabin in which I have spent a great many months in different years. We attracted the birds there. A chimney swift had her nest in the chimney. We put a mirror in the fireplace and could see what she was doing. On the ends of the logs the robins nested. At the doorway a vireo had her nest and the male staid on the nest and sung as they often do. Right overhead was a rose-breasted grosbeak's nest and the male—here is another bird which sings on the nest. We often saw and heard him singing. The peculiar thing about that bird is that when a hawk came overhead he would continue his singing just the same, but his voice would lower and sound as if it came from away off in the woods. He seemed to be a sort of ventriloquist. Right at the end of the cabin a great barberry bush grew. We fertilized it with ashes and other fertilizer, and so it grew six or eight feet high and it was covered with barberries. The grouse and the partridges came from the woods and fed on the berries within six feet of our window. We never could get a picture of them because they always came in the morning when the light was too poor to take the picture of a moving bird; but they came about the place and we sometimes saw the mother birds with their young. If you have some of the plants which bear wild fruit that we do not eat, and protect these plants, or if you set them out, you can attract the birds in that way. You may put out a little water in a pan in which birds bathe and drink and in a dry time a little mud is appreciated by the robin and you may see her taking it for her nest. The swallows and the phebes will do the same. A fountain on the lawn after the grass is cut so that the cats cannot sneak up, is another nice thing in which to water the birds, and if you give them water enough they are not so liable to take the fruit. A few species of birds because of their great appetite are very destructive to some kinds of fruit.

A little about attracting birds in the summer. There are a few things we can do, which I have not time to explain. In one case meal worms were used to attract robins, bluebirds and other insect eating birds in the summer and they became very tame.

I will close with the story of a bird house that two children put up at the beginning of the summer vacation. The children

had seen their father put up bird houses and had noticed that birds nested in them and they wanted a bird house of their own. So they went up in the loft somewhere and found an old bird box. They got a small post and nailed the bird house on—not very true and straight—and then they got some tool and dug in the hard, stony ground, and finally after two days they got the nesting box up. This was nearly the first of July, rather late for a brood, but it happened that a female bluebird had just reared her young in another box and she turned them over to the care of the male and went right about building her second nest in this box. The female often starts another nest while the male takes care of the first brood. These children watched that box very carefully. They had a little door in front so they could open it to look in, and everything went well until the young birds were almost ready to fly, and then happened something which often happens. There came a cold hard rain and it rained so very hard that it either beat the insects down into the ground, or the old birds were wet down and caught by cats,—at any rate they disappeared. The old bird was never seen again. Prof. Hodge came home that night and he heard these little birds in the nest crying for food and said, “Here is something wrong.” He went down and found them hungry and undertook to feed them but they did not know him and they would not feed. Finally he hit on the plan of whistling and calling like the old bird, and he crept up to the box with some meal worms in his hand which he had brought for the young birds. Then they came into his hand and fed and then away they flew into the trees and staid all night under the leaves in the rain. The next morning it was still raining, and Dr. Hodge came along down the sidewalk holding up his umbrella and a little bird came from an apple tree over the fence and alighted on his arm. He took the little one into the house and put it in a shoe box. To make a long story short, by the next morning all those birds were in that box. The children undertook to feed those birds and take care of them and I can assure you they had all they cared to do. They had to take an insect net and sweep the grass, the ground and the trees to get enough insects to feed them. But they managed to do it, with the help of the meal worms, and so the little ones waxed fat and hearty. By and by there came a day when they wanted to fly away.

They got to the window and flew up and down the glass, and the children opened the window and let them go. They never expected to see these little birds again, but the next morning back they came, calling for food. The children opened the window and spread the window sill with food and every day for some days they fed them in that way. Finally the birds flew away and did not come the next morning. So the children went out under the trees and called and the birds came to be fed, and all through the summer whenever the family sat out in the yard under the trees the bluebirds would come to their hands to be fed.

If we can teach our children to take an interest in the living birds, to put up bird houses, and to care for the orphaned young, such children will always have a tender feeling for the birds and thus the whole problem of the protection of birds for the future will be solved.

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WEDNESDAY MORNING.

### ADDRESS OF PRESIDENT.

W. H. CONANT, Buckfield.

#### *Ladies and Gentlemen:*

It is a pleasure to welcome you today to this, the fifty-first annual meeting of this society, and also to congratulate our members on the splendid crop of clean fruit produced this season, which demonstrates over again that Maine can produce both quality and quantity. With every season come new problems and in this respect 1914 is no exception. While the year 1913 closed with a tremendous shortage of apples and high prices, the season of 1914 opens with a normal crop, and with it that wail we have so often heard, big crop and over production. There is no question but that the European war has had a paralyzing effect on the foreign markets as well as our home markets. Germany in recent years has been a heavy buyer of Maine apples. This trade has been entirely cut off. England, however, has taken a large quantity of apples at a low price; this, with the increase in ocean freight charges, and the extremely





Annual Exhibition Maine State Pomological Society, Bangor, Nov. 17-19, 1915, looking down the left side of City Hall.





hot weather causing fruit to land in poor condition, has made net returns small on early shipments. With cooler weather and apples arriving on the English markets in good condition, more satisfactory returns are being realized.

Our home markets have been dull and many of them overstocked with out-of-season varieties. I received a letter from a Providence produce house, October 25, saying that the market was overstocked with winter fruit, such as Ben Davis and York Imperials, but was nearly bare of fruit fit for immediate consumption. With our home markets overstocked and dull, there comes a cry through the press and otherwise from the consumer who is paying the same price per peck as last year when apples were scarce and high. It must be apparent to every interested fruit grower in Maine that our present system of distribution is bad, and will continue to be so until the growers apply some remedy looking to a solution of this problem.

Our greatest need at present would seem to be coöperation or business organizations among the producers, not to fix prices or control markets, but to erect warehouses and storage plants at every shipping center throughout the fruit belt, which would enable them to more economically and efficiently market their fruit.

The storage problem has been previously brought to the attention of this body and is an important one. I would recommend that this Society, at the coming session of the Legislature, ask for an appropriation sufficient to provide for an experimental storage plant in connection with the state farm at Highmoor, to demonstrate what sort of storage would best meet the needs of this important industry, and that a committee be appointed during this session, to be known as the storage committee, to carry out these recommendations.

While there have been laws enacted regulating the shipping of nursery stock into our state, and rigid inspection provided for, that no diseased stock shall be permitted to enter the state, yet the fruit industry receives a tremendous blow every year, in that an enormous per cent of the nursery stock shipped into Maine does not prove true to name. This is a matter of vital importance to every fruit grower and is worthy of careful consideration looking to some remedy whereby the purchaser may be able to secure stock with some assurance that it will prove true to name.

I wish at this time to express in behalf of this Society our appreciation of the untiring efforts of Maine's Commissioner of Agriculture and of the hearty coöperation and valuable service rendered by that department in promoting the interest of pomology throughout the state; also our appreciation of the assistance rendered by the extension department of the College of Agriculture, University of Maine, through their county demonstrators.

The severe cold weather of the past winter brought relief to our fruit growers so far as the brown-tail moth is concerned and relieved a strained situation relative to picking the winter nests. However, with this tremendous setback, they will soon be with us again, and the laws regarding their control should be strictly enforced.

The tent and forest caterpillar have done an alarming amount of damage the past season in many sections of the state, completely defoliating thousands of fruit trees as well as a great many shade and ornamental trees. It seems unfortunate that a pest so easy to control should be allowed to continue its depredations. There is still need of a vigorous campaign of education regarding the control of these orchard pests.

While we have produced a good crop of practically clean fruit the past season, yet the fungus troubles are much in evidence and it is necessary that our growers keep up the fight against these diseases if they hope to produce fruit of the finest quality and place Maine at the head of the list as an apple producing state.

I am glad to report that many of our growers who were not at first in sympathy with the Maine law relative to the grading and branding of apples realize today that it is the only means by which we can hope to raise the standard of Maine fruit in the markets of the world. As a direct result of this law, buyers of fancy fruit have come to Maine this season for the first time and have been strongly impressed with the quality of fruit and the way it was being graded.

I believe there are few wilful violations of this law, but through a lack of proper knowledge as to what constitutes a proper branding, too many barrels are shipped out of the state poorly marked, and it is my judgment that a larger appropriation should be made, providing for the enforcement of this law to

enable the Commissioner of Agriculture to place more inspectors in the field during the shipping season and through them carry on a campaign of education regarding the proper grading and branding of apples.

The splendid achievements won by this Society in the past should spur us on to even greater efforts in the future in carrying on our educational campaign for better fruit, better grading and branding, more coöperative organizations among our growers, more warehouses or central packing houses, that a more uniform pack be secured, and better shipping facilities.

To accomplish this our Society needs the hearty coöperation of every live fruit grower in Maine, and I believe a strenuous effort should be made along this line, until every interested fruit grower is enrolled as a member of the Pomological Society, and the fruit industry of Maine is placed on a solid business basis.

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## ORCHARD EXPERIMENTAL WORK IN NOVA SCOTIA,

CONDUCTED BY THE DOMINION EXPERIMENTAL FARMS.

PROF. W. SAXBY BLAIR, Kentville, N. S.

*Mr. Chairman, Ladies and Gentlemen:*

The experimental farms with which I am associated are under the control of the Dominion Government. A number are located at different parts of the Dominion. In Nova Scotia we have two. The one I am associated with is devoted pretty largely to the fruit experimental work. We are located in the principal fruit growing section of Nova Scotia, hence we naturally are supposed to do all we can to assist the fruit growers of that particular section. We have large fruit interests there, and our first thought in taking up the work from an experimental standpoint was to find out, if possible, how to assist the growers to grow a better quality of fruit and to get more money out of it than they are getting at the present time. We find, even in these sections, where tree fruit growers are well organized, where they have the best facilities for getting their products on the market and getting the biggest prices for these products,

that in a great many cases they are not growing the product they should, hence they do not reap the full reward of their labor.

In looking into the matter for the purpose of deciding what was the best to do in an experimental way, we found that too large a proportion of No. 3 fruit was grown. Our people had failed to recognize certain things which are well recognized by the western fruit grower, and which are recognized no doubt by the majority of your fruit growers. Take, for instance, the one thing—the thinning of fruit for the purpose of getting the largest returns from the orchard. It was the office of the experiment station to take up the matter and prove that the removal of a per cent of fruit by thinning would not mean any loss, but a decided gain to the fruit grower. We planned out a series of experiments so that we could tell the fruit grower at once whether he could make any profit by removing fifteen to twenty per cent of the apples. The results are tabulated herewith. This work has been conducted for the past three years.

#### APPLE THINNING EXPERIMENT—1912.

To determine whether any gain would result from removing some of the fruit from heavily laden trees, experiments were conducted during the season in an orchard in Berwick, N. S. The variety in this experiment was Gravenstein. The work of thinning was done on July 30. This was about two weeks after the usual drop had occurred. The work should have been started ten days earlier for best results. The trees selected were as nearly alike as it was possible to get them and they had apparently the same set of fruit. From the thinned trees all spotted and ill-shaped fruits were removed, and only one apple was left to a fruit cluster. The apples were left from four to six inches apart and were evenly distributed over the tree.

After thinning, the ground under the thinned and unthinned tree was cleaned, and apples falling after that time were counted. This was done to find out whether thinning would prevent excessive dropping which occurs in Gravensteins if they are heavily filled just before the fruit is mature, and also to get the number of apples each tree had on it to start with. A record was kept of the number of apples thinned from the tree.



It was found that the thinned tree had 3,137 apples and that the unthinned tree had 4,065 apples when thinning started.

*Drops from thinned and unthinned trees.*

	Tree Thinned.	Tree not Thinned.
Per cent of total set removed by thinning..	18.5	
Per cent of total set which dropped after thinning .....	12.2	19.1
Per cent of total set harvested.....	69.3	80.9

It will be seen that 19 per cent of the total number of apples on the tree at the start dropped from the unthinned tree and that only 12 per cent fell from the thinned tree. There was a lessened drop of 7 per cent from thinning. This falling for the most part occurred from a little over a week before, up to picking time. The fruit was picked on September 20, which was before any serious dropping had occurred. Apples which fell from the tree at picking time were not counted as drops.

*Increase in Size.*

Apples to the barrel from thinned tree.....	517
Apples to the barrel from unthinned tree.....	593
Per cent increase in size from thinning.....	12.81

*Grade of Fruit.*

	Thinned Tree.	Unthinned Tree.
No. 1. ....	70.00	42.00
No. 2. ....	23.80	38.65
No. 3. ....	5.60	16.13
Culls .....	.60	3.22

This table shows that the thinned tree gave an increase of No. 1 fruit of 28 per cent and thinning decreased the No. 3 fruit 10.53 per cent.

The thinned tree gave 23.29 per cent less crop than the unthinned tree. It will be seen, however, that at the start the unthinned tree had 22 per cent more apples on it. The actual loss from thinning was, therefore, only 1.29 per cent.

From an acre of 40 trees the gain from thinning as indicated by this experiment at prices realized this year, would be as follows:

*Yield and Value of Fruit Per Acre.*

	Thinned.			Unthinned.		
	Per cent.	Yield, bbls.	Value.	Per cent.	Yield, bbls.	Value.
No. 1.....	70.00	153.12	\$382.80	42.00	93.60	\$234.00
No. 2.....	23.80	52.06	83.30	38.65	84.80	135.60
No. 3.....	5.60	12.25	12.25	16.13	36.00	36.00
Culls.....	.60	1.31	.33	3.22	7.20	1.80
Total.....	100.00	218.74	\$478.68	100.00	221.00	\$407.40

This shows a total gain of \$71.28. The cost of grading and thinning in the thinned tree was 11 1-3 cents per barrel. The cost of grading in the unthinned tree was 10 cents. The thinned fruit cost much less to grade, and, as is shown, the thinning in this experiment cost only 1 1-3 cents per barrel after extra cost of grading the unthinned is deducted. This made a total cost for thinning of \$2.62 per acre, giving a net return of \$68.66 per acre in favor of thinning.

THINNING EXPERIMENTS—BRIDGETOWN—1913.

Experiments in thinning were conducted at Bridgetown in the orchard of F. H. Johnson. The variety Blenheim was used. Five trees were thinned and these were compared with seven trees unthinned. The trees were uniform and appeared to be equally well set with fruit. Approximately 17 per cent of the apples were removed from the thinned trees on the 15th of July.

The apples were counted when picked and were packed by the Banner Fruit Co. Ltd., Bridgetown. The apples were shipped to England through the United Fruit Companies of Nova Scotia Ltd. In addition to the usual marking, the letters A. B. F. were put on the barrels of unthinned fruit and M. B. D. on the barrels of thinned fruit so that the shipment could be traced to the selling point.

Assuming that the apples would have been the same on thinned as on unthinned trees, had the thinning not been done, the yield from five trees would have been 19 barrels or the same as that actually picked. This shows that thinning does not nec-

essarily lessen the yield, for the increase in size of fruit makes up for the apples removed by thinning.

The apples were sold on their merit and the purchaser knew nothing of the nature of the experiment. The following prices were received.

	Unthinned Trees.	Thinned Trees.
	Fruit.	Fruit.
No. 1 .....	\$1.67	\$2.01
No. 2 .....	1.67	1.66
No. 3 .....	.74	.74

The No. 1 fruit for the thinner trees, it will be noticed, sold for 34 cents per barrel more than for the same grade in the unthinned trees.

#### *Thinning Experiment.*

Total number of apples on unthinned trees.....	24,014
Total number of barrels, tree run.....	37
Average number of apples per barrel.....	649
Number of apples removed by thinning.....	2,099
Number of apples on thinned trees.....	10,426
Number of apples per barrel, tree run.....	548

#### *Packed Out Results.*

	Unthinned Trees.	Thinned Trees.
No. 1 .....	11.75 bbls.	11 bbls.
No. 2 .....	8.5	4
No. 3 .....	9.50	2.75
Cull .....	4.75	0.00
Slack .....	2.50	1.25

#### *Profits from Thinning.*

Unthinned Fruit.				Thinned Fruit.		
GRADE.	Bbls.	Price per bbl.	Total.	Bbls.	Price per bbl.	Total.
No. 1.....	31.8	\$1.67	\$53.10	57.8	\$2.01	\$116.17
No. 2.....	23.	1.67	38.41	21.1	1.66	35.02
No. 3.....	25.7	.74	19.01	14.5	.74	10.73
Cull.....	12.8	.30	3.84			
Total.....			\$114.36	Total.....		\$161.92

For comparison and calculating on the basis of 100 barrels tree run the above results are obtained which gives a profit of \$47.56 from thinning 100 barrels.

## THINNING GRAVENSTEIN.

An experiment in thinning Gravensteins similar to that in 1912 was carried on this season and the results obtained compare favorably with the results of last year, giving a like increase in value of the thinned fruit.

The thinning was done on July 22, when the apples were the size of small crabs and the thinning was done so that only one apple was left to a cluster; 14.61 per cent of the total apples on the tree was removed.

The No. 1, 2, 3 and cull apples were counted and the total ascertained. The fruit was packed by one of the companies of The United Fruit Companies of N. S. Ltd., without regard to any difference of treatment.

The following results were obtained:

	Thinned.	Unthinned.
Number apples picked.....	3,447	3,897
Number apples removed.....	590	
Total apples on tree before thinning.....	4,037	3,897
Per cent apples removed by thinning....	14.61	
Per cent total weight grading No. 1.....	65.98	54.43
Per cent total weight grading No. 2.....	14.59	12.44
Per cent total weight grading No. 3.....	19.02	30.23
Per cent total weight grading Cull.....	.41	2.54
Per cent total weight grading No. 1 and 2	80.57	66.87

Though it will be seen by the foregoing table that more apples were picked from the thinned than from the unthinned trees, yet when the number of fruits removed from the thinned tree is taken into consideration, we have a total of 4037 in the thinned tree against a total of 3897 apples on the unthinned tree.

By making a comparison between the number of apples on each tree before thinning took place and the number of pounds of fruit taken from each tree, and by calculating the weight of 100 apples as picked from the trees, we find that we have a decrease in weight due to thinning of 1.2 lbs. in every 100 fruits picked, which gives a total decrease of 43 lbs. in the fruit picked from the thinned tree.

By taking the per cents of No. 1, 2, 3, and cull fruit as obtained from the unthinned tree we would have had .18 bbls. No. 1, .04 bbls. No. 2, .10 bbls. No. 3, and .0085 bbls. cull fruit which would have been worth at the prices given below 72 cents., 11.11 and no cents respectively; making a total of \$0.94.

As this is a loss due to thinning it should be deducted from the total increase on the thinned tree as shown below.

*Values of Thinned and Unthinned Fruit.*

NUMBER.	Price per bbl.	No. packed bbl.	Value.	Bbls.	Value.
1.....	\$4.00	4.86	\$19.44	4.05	\$16.20
2.....	2.83	1.08	3.06	.92	2.60
3.....	1.12	1.41	1.58	2.27	2.54
Cull.....	.25	.03	0.00	.19	.05
Total.....		7.38	\$24.08	7.43	\$21.39

Balance in favor of thinning per tree, taking picked apples ..... \$2.69  
Deduction due to loss in total crop from thinning (as shown) ..... .94  
Real increase in value from thinning per tree..... 1.75  
Taking 20 bearing trees per acre per year the increased value from thinning 1 acre is..... \$35.00

The price per barrel as given in foregoing table was the average price obtained by the United Fruit Companies of N. S. Ltd. for their first cargo of Gravensteins shipped to England.

THINNING FRUIT AT BRIDGETOWN—1914.

Gravenstein trees uniform in set of fruit were used. 12.1 per cent of apples were removed the latter part of July. The picked fruit from the unthinned trees averaged 2,658; the thinned, 2,328 apples per tree. The number of apples removed from the thinned trees averaged 321 per tree. The unthinned trees gave 443, the thinned 388 apples per barrel per tree run. The results were as follows:

	Unthinned.	Thinned.
Per cent No. 1 fruit.....	77.88	89.29
Per cent No. 2 fruit.....	12.93	6.60
Per cent No. 3 fruit.....	6.39	4.11
Per cent Culls.....	2.80	



Nonpareil trees uniform in size were also used in a similar test, 17.4 per cent of the apples being removed early in August. The picked fruit from the unthinned trees averaged 2,492; the thinned, 2,668 apples per tree. The number of apples removed from the thinned trees averaged 562. The unthinned trees gave 667; the thinned, 623 apples per barrel, tree run. The cost per tree for thinning was 25 cents. The results obtained were as follows:

	Unthinned.	Thinned.
Per cent No. 1 fruit.....	50.39	59.02
Per cent No. 2 fruit.....	32.42	26.69
Per cent No. 3 fruit.....	10.15	14.29
Per cent Cull.....	7.04	

In connection with the thinning work, some one will say it is a big expense. The expense of thinning is not so very great after all. We figure on about 25 cents per tree, that is, on trees about twenty to thirty years old. You will be surprised to learn how rapidly a person used to it can go over the trees and remove the fruit. To remove this fruit amounts to about \$10.00 an acre, figuring it at 40 trees to the acre. The cost of thinning is more than offset by the ease in packing your fruit at harvest time. If you have a large percentage of No. 2 or No. 3 to go through to get your No. 1 fruit, you can readily understand that you must of necessity take more time in order to get your grading done. So that we find the cost of thinning is more than offset by the increased ease with which the packing can be done after the fruit goes into the packing house. I do not know that it is necessary to spend any more time on this phase of the work that we are following out, I just bring it to your attention because it is one of the things lost sight of by our growers and possibly by some of your growers. I wish to take this opportunity of impressing upon you that in the production of your box fruit, you must practice thinning more or less in your orchards if quality is to be obtained and it is quality that pays.

Question: What time do you recommend doing thinning?

PROF. BLAIR: When the apples are about the size of a crab apple or possibly a little smaller; some say about the size of your thumb. Of course crab apples are different sizes, but a medium sized crab apple. We have generally a considerable

drop along in July. We wait until that is over, then start in on our thinning work. There is an advantage in leaving it just a little late in that you can tell better what fruits will be best to leave on the trees. They form up a little and any fruits that are going to be deformed you can readily detect at that time. On the other hand it is not advisable to leave it too late, because you take a certain amount of energy from the tree. The nourishment required to produce that fruit and carry it along to a certain point, would be wasted, while it would go into the remaining fruit, if the fruits were removed earlier. Our thinning is usually done in the latter part of July. I would say that possibly about the 15th of July would be the time that thinning could be practiced here to advantage.

Question: What distance do you advise thinning out fruit? That is, how near together is it advisable to leave it on the trees? You spoke of two, four or six inches?

PROF. BLAIR: That is a thing that is very difficult to work out,—the distance at which you should thin your fruit. It is a question that the fruit grower must work out, like his fertilizing problem, for himself. Condition of his soil, cultivation given, set of fruit and vigor of trees, all must be taken into consideration. It may be possible that he could thin to eight inches apart and do it profitably, while his neighbor under other conditions could not do so. I would say as a general thing that the first thing for a fruit grower to do would be to give what we call a general thinning, that is, removing deformed fruits, removing any fruits that have been punctured by insects or injured by insects in any way, or which have any sign of scab; also where there are two or three apples in a fruit cluster, removing to one. That is what I would suggest for the grower, and then he can follow on from that, thinning more vigorously if he finds it profitable. In any case I would not advise thinning over about six inches under average conditions even for the large apples.

Question: Have you found serious difficulty in fruit becoming too large in any season?

PROF. BLAIR: Yes, there is a possibility of that. A great many of our markets, especially for some varieties that we have, prefer for the table moderate sized apples rather than very large ones and in cases where we have high cultivation we have to be careful not to get abnormally large apples, as we would were too

severe thinning practiced. So there is another case where the grower must take into consideration the soil condition in determining how far he can go with his thinning with profit.

There are a number of things which we are trying to do in connection with our work, some of which may be of interest to you. I did some work a few years ago when connected with the experimental farms before I went to MacDonald College in the province of Quebec, which I think did more to impress upon fruit growers the importance of cultivation and the value of moisture than anything else that has been done. In fact, we can trace back now through our old fruit meetings the gradual development of the orchard cultivation system as practiced through the valley largely from that point. The farmers could see at once that moisture, through the proper cultivation of the soil in the early spring, played an important part in the successful maintenance of the orchard. In connection with that work certain plots were laid out, and soil samples were taken to determine the percentage of moisture in the soil at different periods during the summer time. The following table gives the results of some of these experiments.

SEED MOISTURE TESTS WITH COVER CROPS.

Date when samples taken.	Winter rye.	June 20 oats seeded.	Clean culture.	July 25 seeded to crimson clover.	Seeded to red clover previous year.	Rainfall for. Inches.
May 12.....	18.41	20.00	18.09	20.88	18.93	
May 26.....	17.21	18.02	18.43	21.21	18.97	May .68
June 9.....	12.52	17.84	19.24	20.31	14.04	
June 23.....	10.46	17.40	17.71	20.46	11.65	June 2.29
July 7.....	9.06	16.70	17.46	19.14	11.22	
July 21.....	7.46	13.43	16.35	20.54	12.06	July 2.07
Aug. 4.....	8.23	9.49	15.10	18.11	10.36	
Aug. 18.....	9.80	10.30	15.71	20.26	13.66	Aug. 2.40
Sept. 6.....	17.79	16.99	20.13	24.04	20.22	
Sept. 20.....	14.91	16.31	17.99	18.09	19.87	Sept. 3.63
Oct. 31.....	21.33	19.77	21.42	26.02	19.71	Oct. 5.78

## SOIL MOISTURE TESTS WITH COVER CROPS.

Date when samples taken.		May 23 seeded to oats.	Seeded to red clover previous year, cut July 20.	Seeded to red clover previous year, cut and left for mulch June 16.	Crimson clover seeded June 15.	Crimson clover seeded July 20.	No cover crop. Not cultivated after July 20.	Rainfall for. Inches.
May	15.....	17.40	16.04	17.33	16.50	16.28	17.76	May 3.02
June	1.....	16.37	14.23	13.83	15.25	16.97	14.74	
June	16.....	15.54	14.88	15.94	16.19	15.78	18.02	
June	29.....	16.30	19.06	18.52	17.50	17.97	17.92	June 3.30
July	17.....	11.02	8.08	11.77	13.89	15.65	14.59	July 1.56
Aug.	2.....	5.63	7.26	7.12	9.73	15.50	15.02	
Aug.	15.....	5.17	5.91	5.64	7.87	14.11	14.03	
Aug.	30.....	5.01	4.17	4.37	5.26	9.97	14.36	Aug. 1.53
Sept.	18.....	12.66	10.52	12.58	11.47	14.68	16.31	Sept. 3.38
Oct.	3.....	11.22	9.05	10.61	9.24	12.67	13.06	
Oct.	18.....	9.34	6.71	8.01	6.69	9.44	11.34	Oct. 1.29

The idea that this little experiment conveyed to the fruit growers was that certain crops took a large amount of moisture from the soil, hence it left the soil so the apple tree could not get the moisture it required. On the oat plot it will be seen that during the first part of the season there was 20 per cent of moisture. The moisture content went down rapidly until on August 4 there was only 9.49 per cent of moisture; just at the time when the apple tree was making the greatest drain upon that soil of moisture and when the greatest evaporation was going on from the tree, when the tree could withstand the effects of the drought less than at any other time. The soil had no moisture in it for the very reason that the crop of oats which had been planted in the orchard had taken the moisture up and thrown it off into the air, hence causing injury. Now a clean culture plot right along side of this, where the ground was kept cultivated as we know we should keep our orchards cultivated in the early part of the season, followed by a cover crop, had at the same date fifteen per cent, a gain of five per cent. The difference between ten per cent and fifteen per cent was favorable to the tree's getting the moisture supply required to carry it along and to make use of the plant food in the soil at that time, whereas the other condition did not favor growth for the simple reason that there was not a sufficient amount of moisture there for that purpose. This work was followed up on clover plots; that is, clover which had been seeded the previous year—a practice followed by a great



number of our growers—was allowed to grow to find out what effect it would have in drying out the soil. A great number of our growers follow this practice, letting their clover grow in the spring time and run along until the latter part of May and June and then plough, which is a very bad practice. We found that whenever clover was growing the middle of July there was only 11 per cent of moisture. The effect of this, then, has been that the fruit growers have avoided the spring clover crop in their orchards—not allowing it to grow in the spring time—and have come back to the system of cultivating, working up their ground early, and then have followed with their clover or vetch cover crops so as to withdraw, if necessary, the moisture towards the latter part of the season. The date to sow these cover crops has been worked out to a greater or less extent. For instance, crimson clover sown on the 15th of June, compared with that sown on the 20th of July, shows that the soil moisture content went down to 9.73 per cent against 15.50 per cent where sown later, indicating that it was possible for the fruit grower to sow his cover crops too early; also indicating that if the fruit grower wished, he could, by the manipulation of his crops, dry out his soil at certain periods and in that way check his tree if he thought it desirable to do so, hence possibly get a better color of fruit, as we sometimes think does obtain if a certain check is given to the tree at a certain time toward the latter part of the season.

I will not dwell on these experiments any longer, except to point out this,—that in work of this kind you have something definite and accurate that assists the grower, and something that he must have in order to follow out what we consider up-to-date practices. It is no use for me to tell the farmer that an oat crop will take so many pounds of water from the soil in a certain period, or that the crop will be lessened by the growing of a certain grain crop or grass crop in the orchard. But we must get at it from the standpoint of the moisture content to show that the tree must have a certain quantity under certain conditions in order to make use of the plant food that the soil does contain.

In connection with the planting of young trees we tried some experiments for the purpose of finding out whether it was desirable or not to use fertilizer of any kind when the young trees were planted. Probably some of you growers have, when



setting a tree, put a handful, or two or three, of fertilizer around the young tree after the tree had been planted, or possibly thrown it in when the tree was being planted. I wanted to find out whether it was possible to injure a young tree because I knew this practice was followed by growers. A great many of our people take a small bag of fertilizer, and think that in planting a tree, two or three handfuls thrown around it will just send it right along. This work was followed at the rate of from 600 pounds to 3000 pounds per acre, applied around the tree at planting time. The work was duplicated by mixing this quantity of fertilizer with the soil dug out for planting the tree. We found the first year that in every case where the larger quantity was used there was lessened growth, and that the check plots on which there was no fertilizer at all, made a better growth the first year than where the fertilizer was used. Where we used a moderate quantity of fertilizer, 600 pounds to the acre, the trees made growth somewhat similar to the trees alongside which had not received any fertilizer at all. And even where the manure was used around the trees the growth was not as good as where the manure was not used. Of course good cultivation was given.

Question: What was the condition the second year?

PROF. BLAIR: I am coming to that—dealing with the first year first. On the trees where the manure was worked into the soil before the soil was put around the trees, the results were not as good as where the manure was put on the surface and worked in. Also, the fertilizer put upon the surface and worked in to a depth of three inches did not cause the damage to the young tree that the fertilizer did where it was mixed with the soil thoroughly into which the tree was planted.

The second year we expected to see something a little more definite, but after making careful notes of the four varieties we had under test, and taking measurements at different places, we found that there was little difference in all the trees to which the fertilizer was applied, except that where the 3000 pounds was used the growth was not quite so good as when from 600 to 3000 pounds was used.

Question: You mean 600 pounds to 3000 pounds on little trees as you set them out?

PROF. BLAIR: At that rate per acre.

Question: Yes, but that is an enormous amount. How did you go to work to apply so much?

PROF. BLAIR: We find lots of fruitgrowers in our section who will take two or three handfuls of fertilizer and scatter it around the young trees. They do not realize what a quantity they are putting on. One ounce of fertilizer to a square yard is equal to 300 pounds per acre, so when you take a handful of fertilizer, you are not applying it at 300 lbs. per acre, but usually at the rate of 1500 to 2000, in some cases 3000 lbs. per acre. What I was getting at in connection with this problem was to find out whether an injury did result from this application, and whether that was a waste of material or not. The results would seem to indicate that in the planting of young trees, if you have conditions right for the tree other than plant food, you need not necessarily pay very much attention to the plant food requirements.

Question: About how many pounds of fertilizer would that mean on an actual acre of orchard?

PROF. BLAIR: At the rate of 2,000 pounds per acre the quantity of fertilizer actually applied by the acre of orchard would not be very great. In the planting of young trees we will assume 40 trees to the acre, each to occupy one square yard, and one ounce to each tree represents at the rate of 300 pounds per acre, or 40 ounces on the acre which would not be a very big expense; but it is not so much a case of saving, it is the energy used in putting that fertilizer there and whether there is any benefit derived from it, and whether 1-2 lb. to the tree or at the rate of 2400 pounds per acre will do more injury than it will good.

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## BEE KEEPING AND ITS RELATION TO FRUIT GROWING.

O. B. GRIFFIN, Caribou, Maine.

It is not my purpose at this time to deliver an address which may be considered the last words on the subject, or to go into the technical side of the question in a way that, perhaps, neither you nor I would fully understand, nor shall I attempt to go into details in fruit culture as there would hardly be sufficient time to

discuss the subject of fruit growing and bee-keeping in this way, to much profit.

While the growing of fruits and flowers has always possessed much of interest to me, and I have received in the pleasure derived from their culture, even in a small way and in a careless manner, much more than the effort cost me, I am not able to cite instances in my own experience in many cases but must depend on those attained by others.

While I feel as do most Aroostook people, I think, that my lot has been cast "in pleasant places," in one of the best counties in our peaceful nation, yet at times, yes, many times, I have felt the call too strong almost to be resisted, to emigrate to central or southern Maine or some other fruit belt and take up the growing of fruit, in connection with bee-keeping, as a vocation. I can hardly imagine an occupation that would return larger profits in health and happiness, and insure, if managed in a business-like manner, a comfortable income, at least. What more could one desire than this?

I want to digress from my subject a little, right here, to say that it has seemed to me that the men in Maine outside of Aroostook county, who have good orchards or land suitable for orcharding, and have neglected this branch of farming to take up potato growing, are making a mistake. There are exceptions, of course. The man who has no liking for an apple tree or bushes that bear fruit, is doing right, I think, to leave their culture alone and take up something more to his liking. But I believe this,—that the same amount of effort expended in growing and properly marketing apples in Maine, outside of Aroostook, will bring larger cash returns and much more in real pleasure and peace of mind, than will the growing of potatoes.

I realize that with the conditions existing this year, most of you no doubt feel somewhat discouraged with apple growing, but I can assure you there are few potato growers getting rich. I am inclined to the belief that one of the great needs of the apple grower in this state is better facilities for storing and holding the crop and putting it on the market when it will bring paying prices, rather than to be forced to market it in the fall or early winter at a much less margin of profit. There will be many barrels of apples in this state this year that will go to waste,

no doubt, that could be marketed if the proper machinery could be set in motion to reach the would-be consumer.

In my own county there is nearly always a surplus of fall varieties of apples. Some years barrels of them decay on the ground, but it will not be very long, even this year, before we will be paying five cents apiece for apples grown on the Pacific coast, that are not a whit better, if as good, as a properly grown Maine Baldwin, Northern Spy, Black Oxford, Nodhead or several other varieties that could be mentioned.

I only speak of these things at this time, or of this side of the question, to encourage you and possibly to enthuse some of you to reach out after better things that are within your reach; and to possess a confidence in the business of fruit growing.

Possibly many of the apple growers of this state might learn a profitable lesson from the Aroostook potato grower. They are looking ahead through the coming years, expecting to grow potatoes and planning how they may grow better potatoes and grow them more cheaply. Different political parties may overhaul the tariff, or other issues may arise, but the average potato grower maintains or increases his acreage. But gradually the potato grower is realizing that he is neglecting the vital end of the business, the marketing of the crop when grown. And I am inclined to the view that the apple grower could profitably pay more attention to the marketing of his crop.

But I am getting away from my text, "The Honey Bee and Its Relation to Fruit Growing."

When first we are told that flowers are of two kinds, the staminate and pistilate, or male and female flowers, and that the pollen, the fine flour-like substance clinging to the blossoms, is the fecundating or life-giving properties of plants and must be carried from one flower to the other by some agency, before the plant or tree can fruit or bear seed with which to reproduce itself, we are filled with a feeling of awe and admiration for the Great Creator's handiwork.

When we partake of the sweets which the industry of the honey bee, coupled with our own care and planning, has made possible, we are apt to lose sight of the prime purpose of the creation, no doubt, the fertilizing of fruits and flowers.

There are other agencies beside the honey bees which carry out this end, or at least play an important part. The wind is an



important factor in distributing pollen, and in some cases may be sufficient, while with flowers having a very deep calyx, as the squash, pumpkin or melon and cucumber, the need of some other agency is apparent.

When the growing of cucumbers was undertaken under glass, it was necessary for some one to take a fine brush and go among the vines, touching first one and then another of the flowers, until the vines had all been gone over. This had to be repeated every few days through the blossoming season to insure a profitable crop. Eventually some enterprising fellow, who may have been a trifle lazy, or did not like his work, conceived the idea of putting in a colony of bees and lo! this thing was accomplished much better and far cheaper than could be done by human hands.

There are in nearly all countries some wild bees that to a greater or less extent, perform the office of carrying pollen. Even in our own state where there are many hindrances to the wild bees, in our unfavorable weather conditions, in some years we receive nearly full crops without the aid of the honey bee in large numbers.

The honey bee is the natural accompaniment of civilization. With the increase of population came the naturally increased demand for fruits and the destruction of the forest, the natural protection of wild bees and pollen carrying insects.

Thirty to fifty years ago, the bumble or *humble* bee was found in large numbers in most parts of the state. Today there are but few, except in some favored localities. In the early days of Aroostook county the growing of red clover seed was quite an important industry and quite a profitable one. For several years past this has not been a profitable crop, as the heads do not mature enough seed for a paying crop. And it is the lack of these humble insects, the humble bee, which is very largely if not entirely responsible for the difference of three and four hundred pounds of seed per acre thirty-five years ago and one hundred pounds or less, which may be secured today.

Several decades ago the growing of red clover was tried in New Zealand and the plant was found to thrive splendidly, but it produced almost no seed. Scientists took up the matter and bumble bees were imported from the United States, through our Department of Agriculture. As soon as they had time to multiply, which they did quite rapidly under their favorable climatic conditions, good crops of seed were secured.



The tube petals of red clover are so deep that the honey bee is not able to secure much nectar from the blossoms, except in years when drouth or other conditions caused them to be shorter or the nectar being more abundant, they are able to work on it to advantage. Consequently the blossoms are not visited by the honey bee to any extent, causing a lack of pollination.

While the apple grower may secure a paying crop of fruit without the presence of honey bees, some years, there are other years when, with a full bloom, little fruit is set. Many times, had bees been present in sufficient numbers in those off years, a paying crop would have matured. With a favorable winter and spring, wild bees and other insects will be quite plentiful and assist largely the work of pollination in the orchard. In other years, there are too few to be of importance.

The honey bee, if the colony be strong, will fly out and visit the blossoms in search of nectar. When the days are cold, little nectar is secured, but the purpose of pollination will be accomplished. It is, therefore, of importance that colonies be kept as strong as possible if the best results are to be attained in the pollination of the blossoms, and of equal importance in securing a crop of honey.

To have strong colonies in early spring, we must have the right conditions for wintering,—suitable stores and plenty of young bees when they go into their winter quarters.

In the buckwheat sections of New York, a few years ago a man went to his neighbor, one of the most prominent bee-keepers and a well-known authority on bees and subjects pertaining thereto, and told him he thought he should be willing to pay him in honey for the pasturage furnished by his large buckwheat fields. Somewhat to his surprise, his neighbor readily agreed to do this and they settled on a certain number of pounds of honey per acre. "Now," said the bee-keeper, "you are a fair-minded man and I feel that you are owing me quite a little sum of money or several bushels of buckwheat." The man asked for an explanation. Said the bee-keeper, "You tell me your crop averaged you some thirty-six bushels per acre; the average for the state is less than twenty. In sections a few miles from here where you admit the soil is as good and the farmers as thorough as yourself, but where no bees are kept,

the average has been about sixteen to eighteen bushels per acre. In every locality where bees are kept in any numbers in this state, the results are practically the same."

As the comparison was much in favor of the bee-keeper the man said, "I think I had better call the account balanced if you are willing." The bee-keeper assured him that he was willing, but insisted that he take a case of honey home without cost to him and told him an honest understanding of things always made better neighbors and friends.

I will cite a few instances of the value of bees in the orchard and I assure you it is my honest opinion that the honey bee is of much value to the fruit grower, whether of tree or bush fruits. While the strawberry furnishes little, if any, nectar, the bees work on them for the pollen and are of much value.

That well-known orchardist, J. L. Van Rensselaer, in 1912 rented an old orchard in Ohio, of fifty acres, which was returning little profit to its owner. With thorough pruning, cultivating, spraying and fertilizing, he secured in 1913 a large crop of nearly perfect apples. He attributes much of his success to the placing of fifty colonies of bees in the orchard previous to the blossoming season. He desired more bees but could not readily secure them and thinks the crop would have been much larger had he had twice the number of colonies.

Prof. A. J. Cook, Professor of Entomology, in 1891, at the Michigan Agricultural College, said:

"I tried many experiments last spring. I counted the blossoms on each of two branches, or plants, of apple, cherry, pear, strawberry, raspberry and clover. One of these in case of each fruit, or each experiment, was surrounded by cheese-cloth, just before the blossoms opened, and kept covered till the blossoms fell off. The apple, pear and cherry were covered May 4, and uncovered May 19 and May 25. The number of blossoms considered varied from 32, the smallest number, to 399, the largest. The trees were examined June 11 to see what number of the fruit had set. The per cent of blossoms which developed on the covered trees was a little over two, while almost twenty per cent of the uncovered blossoms had developed."

J. F. McIntyre was a delegate at the California State Fruit-growers Association for 1893 and reports:

"A gentleman stated that he had a friend in this state who started into fruit growing several years ago, locating thirty-five miles from any fruit growing section, or where any bees were located. The first year that his trees blossomed, when he expected at least some returns from his orchards, what should be the result but complete failure? He was advised to procure some bees to aid in the fertilization of the blossoms. He did so, and since then his orchard has been productive."

C. J. Berry, one whose fruit orchard contains 440 acres and who is horticultural commissioner for Tulare county, Cal., an inland county that has made great progress in the fruit-industry, gives this valuable testimony:

"Bees and fruit go together. I can't raise fruit without bees. I have bees all about my big orchard. Two years in succession I have put netting over some limbs of trees; and, while they blossomed all right, nary fruit; while on the same tree, where limbs were exposed to the aid of bees, plenty of fruit."

Again, Chas. A. Green, for the Fruit Grower, published in Rochester, N. Y., writes:

"It has now become demonstrated that many kinds of fruits, if not all kinds, are greatly benefited by the bees, and that a large portion of our fruit, such as the apple, pear and particularly the plum, would be barren were it not for the helpful work of the honey bee. This knowledge is largely owing to the discovery of Prof. Waite of the Agricultural Department at Washington."

At a joint meeting of the National Pomological Society and the National Beekeepers' Association, occurring on Sept 12, 1901, at Buffalo, a number of valuable papers were read, all of them testifying to the invaluable office of the bee in pollinating fruit blossoms. Space will permit us to give only two references. Prof. James Fletcher, of the Ottawa Experiment Station, among other things, said:

"It will be found that not only are flowers absolutely necessary to bees as the source of their food—nectar and pollen—but that bees and other insects are no less necessary to most flowers, so that their perpetuation may be secured.

"The fact should be recognized by the fruit grower above all others; for were it not for insects, and particularly for the honey bee, his crop of fruits would be far less than they are every year, and even in some cases he would get no fruit at all.

"Failure in the fruit crop is more often due, I think, to dull or damp weather at the time of blossoming, which prevents insects from working actively in the flowers, than to any other cause."

At the same joint meeting of bee and fruit men, H. W. Collingwood, editor of the Rural New Yorker, one of the best and most reliable agricultural papers, said:

"We can easily forgive the bee his short working days when we consider the good he does. There is no question about the debt fruit-growers owe him. People talk about the wind and insects in fertilizing our flowers; but I am confident that any man who will really take the time and pains to investigate for himself will see that the bee is nearly the whole story. I have seen the certain results of his good work in a neighbor's orchard. Those bees 'broke the trees' down just as truly as though they had climbed on the trees by the million and pulled at them. The appearance of those trees after a few years of bee keeping would have convinced any fair-minded man that our little buzzing friends are true partners of the fruit grower."

Prof. Bailey, the very able horticulturist of Cornell University, says "bees are much more efficient agents of pollination than wind, in our fruits, and their absence is always deleterious."

If bees are then of so much value in fertilizing the blossoms, the fruit grower should welcome the bee-keeper and protect the bees.

It has been proven, I think conclusively, that there is nothing to be gained by spraying fruit trees while in bloom, and often they are injured and the crop diminished.

The orchardist can accomplish what he desires by thoroughly spraying just before the blossoms open and after the flower petals have fallen and he will not destroy the bees which are his best friends.

A sweetened poisonous spray would be dangerous to use at any time, particularly so at a time when nectar was not plentiful in the fields. In times of drought bees will take up spray that is not unpleasant to their taste for the water it contains, though it is a question if much harm is done in this way.

Bees are sometimes accused of injuring fruit by puncturing them to get the juices. This, however, bees are unable to do.



They will work on fruits that have been punctured by birds, wasps or other insects or on decaying fruit late in the season when there is no nectar to be found in the natural sources of the flowers.

I have crushed bees when they were at work on over-ripe raspberries and found the honey sacks filled with the red juice of the berries. They will not trouble berries so long as they are firm and in a marketable condition. The small fruit grower need feel no anxiety even when bees are quite numerous in the fruit patch. They will not sting at such times unless they happen to be accidentally jammed when picking the fruit. If they seem at times to be something of a nuisance, remember they have no doubt increased your crop many quarts. The grower of small fruits, both the bush fruits and strawberries, needs the bees among the blossoms to fertilize them and cause them to fruit fully as much as, if not more than, the apple and pear grower.

Many would like to keep a few colonies of bees in the orchard but feel that they have not the time or inclination to care for them.

The purposes of pollination may be accomplished and considerable honey secured in the following manner:

Provide several hive bodies, duplicates of the one in which the bees are hived, and as the season advances, add the extra hives, one at a time as needed by the bees. If it is desired to use the honey in the comb as chunk honey, the frames in the hives above the brood chamber proper should not be wired and strips of thin foundation should be used instead of full sheets of brood foundation. If it is to be extracted, full sheets of foundation and wiring are advisable.

If the extra hive bodies are added at the proper time before bees are crowded there will be little trouble with swarms and at the close of the season, or before being prepared for winter, the extra hives may be removed and extracted or kept in a warm, dry place until the honey is used or sold. The honey can be cut from the frames as chunk honey and sold to near-by customers. The price realized will not be as much as is paid for honey in sections, but more can be secured and it would not cost the bee-keeper as much per pound. The frames in which



much brood has been reared may be saved intact and used as needed by the bees in early spring or as additional winter stores. If an eight frame hive is used, it will be best to have two of the hive bodies reserved as the brood chamber.

I would prefer a ten frame hive, though, to use in this way. The hives may be packed inside a winter case surrounded by leaves or other dry material, for winter, or carried to a dry under-ground cellar where an even temperature may be maintained and light, mice and rats excluded.

If one wishes to keep a larger number of colonies and sell honey to the trade it will be almost a necessity to adopt some style of hive adapted to the production of comb honey in the small wooden boxes called sections of which there are several styles. It will be better to decide on some one style of section and then have all hives and fixtures alike, as several styles of hives and sections in the same yard are a nuisance at best. It is largely a matter of individual taste, or local demand, which style of section you adopt. The standard section most in use is four and one-fourth by four and one-fourth by one and seven-eighths inches; and where separators are used, as is necessary if honey is to be cased, it will hold about one pound. The plain section  $4\frac{1}{4} \times 4\frac{1}{4} \times 1\frac{1}{2}$  or  $4 \times 5 \times 1\frac{3}{8}$  used with a fence will contain about the same amount of honey, but the honey will be filled nearer to the edges of the wood and sometimes will be attached to the fence, so as to make a broken surface and often leakage when removed from the supers. In casing to put on the market one must be a little more careful in handling than where a bee-way section is used. Some think the plain section when filled makes a more attractive package and rather a better seller, but this is lost when honey is sold in cartons.

Too much cannot be said in favor of the use of the carton for each individual section of comb honey. Honey must be eaten just as it is taken from the bees. It cannot be washed or cleaned if soiled by contact with dust, flies or other dirt to any advantage without detracting from its appearance and that is what we buy comb honey for. If it does not appeal to the eye we may as well buy extracted honey. The day when comb honey can be exposed on the grocer's counter or shelves for days and then sold is largely of the past. To be sure, comb honey can be handled and taken to the consumer in as nice condition as in

cartons, but is not apt to be so. In my own practice, the honey is removed from the hive in the supers and tiered where flies or dust cannot reach it. When removed from the supers each section is scraped to remove the most of the propolis, which gives it an untidy appearance, to say the least, and it is at once placed in the paper carton which insures its reaching the customer in as cleanly condition as possible.

If the taste of the bee-keeper, or the market he expects to cater to, prefers extracted honey, the bees may be run for extracted or part comb and part extracted, if the apiarist desires. One must be governed by taste and local or market conditions in deciding which to adopt.

Sometimes the sources from which the honey are gathered are such that comb honey of good appearance cannot be secured while the quality of the honey secured may be very good. In such cases I think it better to work for extracted honey. More honey can be secured in this form, as when the combs are once built they will last for years in good care and in a good flow will be filled very rapidly, while in comb honey production the comb must be built new with each pound. In working for extracted honey, the same style hive may be used except that the super arrangement must be different. Instead of a super case or frames for holding section, half depth frames are usually used and the frames built full of comb.

In comb honey production it is most important that the bee-keeper possess a knowledge of the sources from which he hopes to secure a crop of honey, as a lack of this knowledge may lose for him a large part of the crop, or the season may close, leaving a large part of the honey crop in an unfinished condition. The production of honey, either comb or extracted, fits in nicely with fruit growing, with the exception of strawberries. The picking season and the swarming season with the bees come at nearly the same time and mean a great deal of work for the bee-keeper unless he can be sure of plenty of good help.

In the production of either comb or extracted honey it is of the greatest importance that we have strong colonies of bees of the right age at the right time. To have these conditions we must prepare for them sometime ahead. The season before we hope or plan to harvest a crop of honey we should see that all colonies are in good condition, that is, with suitable hives, plenty

of good stores for winter, and a prolific queen, a young queen preferred in each colony. Then if we provide suitable quarters in which to winter the bees, whether out of doors or in the cellar, we have done our part toward this desired end.

There are several races of bees of which the Italian bee, first imported from Italy, but now bred and kept extensively in this country, is probably the best known and most popular. For the purpose of pollination in the orchards in this state, or for the production of comb honey, I would prefer the Carniolans or our common black or German bee. If working for extracted honey, especially in a locality where a late flow could be expected such as from buckwheat, for instance, perhaps the Italians would be the better bee. In two years' experience with Carniolans I find they winter well and build up rapidly even under adverse spring weather conditions if they have plenty of stores and hives. For purposes of pollination in the orchards of Maine these qualities are valuable and we cannot get strong colonies any too soon, to secure the best results in the production of honey.

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## FERTILIZERS FOR THE APPLE ORCHARD.

PROF. C. A. McCUE, Newark, Delaware.

During the past few years there has been a rather sharp controversy going on among horticulturists regarding the advisability of using commercial fertilizers in the apple orchard. One class contends that it is seldom necessary to apply commercial fertilizers, while another school has insisted that their use was justified. During the past seven years the speaker has had considerable experience with the use of commercial fertilizers in orchard work, although it is to be confessed that this work has been carried on with peach trees more than with apple trees. The peach is more sensitive than the apple to changes in food, climate, and method of cultivation. Yet in all probability, the fundamental principles underlying the use of commercial fertilizers for the peach orchard are approximately the same as those in the apple orchard. My stand on the much debated question of orchard feeding is that both sides are more or less justified in the course they have followed. This seemingly para-

doxical statement is not as bad as it sounds, and I will attempt to make my position clear to you as the subject is developed.

In profitable fruit production, there are many factors that have to be taken into consideration. No one factor is alone responsible for success, although it may be that the absence of one necessary factor may account for failure. Many men are apt to over-emphasize one factor and neglect another. One man may devote all his energies to successful spraying, another to cultivation, yet both may be successful apple growers. Each of these men will have his theory about the proper way to treat an apple orchard and insist that the other fellow is wrong. The man who practices the sod mulch system cries aloud, that all may bear, that sod mulch is the best way to handle an orchard; another one says that cultivation is the only way, and straightway they fall to arguing as to which is right. They fill the air with words and the Experiment Station bulletins and farm papers with printer's ink, neither recognizing that under certain conditions they may both be right. In general, they overlook the fact that moisture is the key note to both their methods. The sooner orchardists and experimenters learn to stop generalizing from the behavior of certain pieces of orchard land under their immediate supervision, the sooner will we have safe and sane methods of orchard culture. Personally, I am a great believer in the "clean-culture cover-crop method" of managing an orchard, yet I recognize the fact that there are many thousands of orchards that can be more profitably and economically handled under the sod mulch system. It is largely a question of water and plant food. It has been my experience both through experimentation and observation that the two great limiting factors in fruit production are moisture and nitrogen. Yet this is not necessarily always the case.

Perhaps at this point, I can do no better than spend a few moments in discussing the so-called law of the minimum. Roughly expressed, it is that no plant can prosper beyond a certain point which is defined by the available amount of all of the factors necessary for its full development. If any of these factors be deficient the plant can prosper only so far as this factor is present. For example, in plant growth there are about thirteen plant food elements necessary for proper development of the plant. If one of these, say iron, is deficient in the soil, the plant can develop only so far, regardless of the fact that all



other food elements may be present in excess. In general, the law of the minimum holds that in order to grow at all, plants require certain minimum amounts of certain factors. As the amounts of these factors increase, so also the growth of the plant progresses up to a more or less definite point known as the optimum. Any further increase of the factors causes a decrease in growth. All plants increase in growth until the optimum of all necessary factors is reached. Thus we can see that trouble in plant production may arise from too much of any one factor as well as from a deficiency of a factor. For example, there is an optimum amount of soil moisture needed for the best development of plants, yet the plant may suffer severely from either drought or an excess supply of water in the soil.

Plant food represents a certain set of factors that are necessary in the proper development of apple orchards, yet plant food is not the only requirement. We need a proper moisture supply, proper pruning, and proper protection against the ravages of insects and fungus diseases. Above all, we should remember that the limiting factors in one orchard may be entirely different from the limiting factors in another orchard. In some sections of the county, a certain factor, say potash or phosphoric acid, or even lime, may be deficient over a large area. In my own section, the limiting factor in the soil for many crops is phosphoric acid, yet phosphoric acid does not appear to be the limiting factor in apple production in that section. One orchard's food may be another orchard's poison.

A large number of experiments in orchard fertilization have been carried on in the United States, yet only a very few of these experiments have been fundamental in principle or of more than local value in their significance. Reports have been made upon only five that have been carried on for a long period of years. There are others that are under way that show promise of ultimately throwing light upon the vexatious problem of orchard fertilization.

One of the most noted of these long time experiments is one being carried on by the Woburn Experiment Station in England. This experiment began in 1894 and is still in progress. In general, this experiment shows but little if any benefit from the application of either barnyard manure or commercial fertilizers.



These results show that plant foods are not the limiting factors in apple production in this particular orchard.

In 1907, a report was made upon an experiment in fertilizing apples at the New York Station. This experiment had been running for twelve years. The fertilizers used were wood ashes and acid phosphate. Here again the results were considered negative, having barely paid for the cost of the fertilizers. Yet a close scrutiny of the figures from this experiment reveals a rather peculiar state of affairs. In the plots under treatment there were five varieties of apples used: Baldwin, Fall Pippin, Rhode Island Greening, Northern Spy and Roxbury Russet. While the combined yields of all of these varieties show but little benefit from fertilizers, the results obtained by considering the varieties separately show that there was a striking difference in the response of the different varieties. Baldwin and Rhode Island Greening made practically no response to fertilizer applications, while Spy and Roxbury Russet showed an annual average gain of 125 bushels per acre. This offers startling proof that the limiting factors for one variety of apples may not be the same for another variety. No nitrogen was used in any of the treatments, hence we have no proof but that a nitrogenous fertilizer might have proved of great benefit to this orchard.

A third experiment is one that has been carried on since 1889 by the Massachusetts Experiment Station. This work was reported upon in 1911 by Director Brooks. The fertilizers used were bone and muriate of potash, wood ashes, bone meal and sulphate of potash, and barnyard manure. In growth of tree, as represented by the circumference of the butts, the greatest results were obtained from barnyard manure. Trees in this plot had increased in circumference about 11 inches more than the trees which had received no fertilizers. The next best gain was made by the use of bone and sulphate of potash. Considering all varieties, the results being for an average of 20 years, the treatments yielded as follows:

No fertilizer .....	88	bbls.	per	acre
Wood ashes .....	286	"	"	"
Bone and muriate of potash.....	322	"	"	"
Bone and sulphate of potash.....	488	"	"	"
Barnyard manure .....	556	"	"	"

The largest fruits have been picked from the treatment receiving bone and sulphate of potash and the smallest from the

plot having had no treatment. The best colored fruits have been found on the wood ashes plot and the poorest colored from the no treatment plot. Director Brooks says: "On the plots having barnyard manure, the fruit has been coarse and ill looking and does not sell well, while that on the wood ashes plot is of extra fine color and appearance and is in great demand."

One of the most interesting points brought out in the Massachusetts experiment is the difference in results between the use of muriate and sulphate of potash, the sulphate giving much the better results. This superiority of sulphate might be attributed to the magnesia in the sulphate or to the bad effects of the chlorine accumulating in the soil from the continued use of muriate.

This experiment has shown without a doubt that on this particular orchard, fertilizer applications have been of great benefit. However, the fact should not be lost sight of, that this was an uncultivated orchard and that the presence of grass growing in the orchard may have profoundly modified the results. In testing fertilizers in orchards, one should make his tests on trees alone and not upon trees and grass. That is to say, experimenters who are searching for fundamental facts in orchard fertilization should not hamper their results by using orchards in sod. The farmer who finds that the sod mulch system of orcharding is the most economical one for him to follow is perfectly justified in using fertilizers as a top dressing in his endeavor to find the plant food deficiencies in his orchard.

The New York Geneva Station has also reported upon another experiment in fertilizing apple orchards. This experiment is unique in that all trees involved in the test were of one variety and all had been budded from the same parent tree. The variety used was Rome Beauty top worked upon Northern Spy stock. Here again, the Geneva Station reports negative results from the use of fertilizers. However, a careful review of their published data seems to show that at least upon one end of their orchard there was some benefit from the use of potash. The land upon which this orchard was planted was chosen for its supposedly uniformity of soil, but the results published show that the available plant food content of the soil over the entire field was not constant and that apparently one end of the field was deficient in available potash. The uniformity of soil con-

ditions for any crop cannot be determined by the external appearance of the soil nor with absolute accuracy by the behavior of other crops upon the land before the test crop was planted. Plants vary greatly in their requirements and the limiters for one crop may not be the limiters for another. The fact that a field yields a uniform number of bushels of oats per acre over its entire acreage is no sign that it will yield a uniform number of bushels of potatoes or barrels of apples per acre.

The most comprehensive set of orchard fertilizer experiments in existence are probably those inaugurated by the Pennsylvania Experiment Station in 1907. It is too soon, however, to draw any fundamental conclusions from the results so far published, although some of their results are very suggestive.

The Delaware Experiment Station has had under way a fertilizer experiment on apples covering the last six years. This is on a young orchard that just came into bearing this past season and it would be folly to attempt to draw any conclusions from the behavior of these trees. A vast difference in growth and appearance of the trees can be seen, but six years more growth may change the relative prosperity of some of these blocks. In this experiment it has been our aim to determine as far as possible the physiological office of nitrogen potash, and phosphoric acid in growing apples. So far many facts concerning the physiological function of various plant foods are surmised, but few facts are absolutely known.

Nitrogen is generally considered the element most concerned with the growth functions of a plant. It, together with phosphorus and sulphur, is concerned chiefly in the formation of protein. The general effect of heavy applications of nitrogen is to produce a heavy growth of the vegetative parts. It retards maturity of both wood and fruit in most plants. In regions subject to long, cold and severe winters, too heavy an application of nitrogen, late in the growing season, will tend to produce a soft, sappy, and perhaps immature wood that will be particularly subject to injury from cold. On the other hand, I have observed in the peach that where heavy applications of quickly available nitrogen were applied early in the spring the fruit buds were as cold resistant as any in the orchard. Properly handled, I believe that there is but little danger of winter-killing buds as the result of heavy applications of nitrogenous fertilizers. In

my experience, I have found that winter-killing of fruit buds has a more direct correlation with soil moisture, air drainage, and humidity, than it has with the plant food supply. In the peach there is a decided delaying of maturity of fruit by the use of nitrogen. By the skilful handling of nitrate of soda as a fertilizer one may be able to delay the normal ripening period of this fruit from a week to ten days. Stewart had similar results with the apple. It is possible, however, that delayed maturity may be accounted for by the decrease in the amount of sunlight reaching the fruit, due to the excessive growth of foliage caused by the nitrogen in the fertilizer. One would expect that heavy applications of nitrogen would give an increased size to the fruit, but this does not appear to be so. On the contrary, we have found in peaches and Stewart has found in apples that heavy applications of mineral nitrogenous fertilizers tend to decrease the average size of the fruit. In the case of the use of barnyard manure this is not the fact; on the contrary, the size of the fruit is increased. This increase is probably due directly to the influence of the humus which barnyard manure forms in the soil, thus increasing the soil's water-holding capacity. Soil moisture probably has more to do with size of fruit than any other single factor.

Trees heavily fertilized with nitrogen, usually produce fruit that is deficient in color. The heavy growth of foliage shades the fruit to such an extent that the proper colors of the fruit fail to develop. It has been pretty conclusively proven that color is more dependent upon sunlight than upon any other factor. In fact, it may be possible that sunlight is the only factor concerned in producing color. It has also been our experience that, contrary to common belief, nitrogenous fertilizers are a great aid to a heavy set of fruit buds. In our work with peaches the trees most heavily fertilized with nitrogen have produced the greatest number of fruits, thus showing that growth and fruit production are not necessarily antagonistic functions of plants. It is probably true, however, that heavy excesses of nitrogen do seriously interfere with fruit production. The soil moisture is here again a most important factor. Decreased or delayed fruit production in orchards heavily fertilized with barnyard manure is probably due more to the addition of humus to the soil, thus increasing its water-holding capacity, than to the nitrogen in the manure.



Trees heavily fertilized with nitrogen are undoubtedly more susceptible to certain diseases than are trees not so fertilized. For instance, fire blight is known to be more virulent on trees that are growing rapidly. We have found in our work with peaches that we had more brown rot on a block of peach trees fertilized with nitrogen alone than we found with any other fertilizer treatment. (Incidentally I may remark that we picked this year an average of about eight bushels of peaches per tree from those nitrogen fed trees.) Stewart of Pennsylvania reports that nitrate-fertilized trees were more resistant to a certain leaf disease.

There has probably been more controversy over the value of potash in orchard fertilization than any other element of plant food. Potash is closely correlated with starch production in the plant, and with protein formation and accumulation. Many virtues have been ascribed to potash, such as earliness in ripening, fruit bud formation, increased color, and curative or immunizing effects upon certain diseases. In our experience with peaches, potash does not appear to hasten the maturity of the fruit to any extent and I anticipate that its effect upon apples would be entirely negligible. Fruits heavily fertilized with potash often have higher color; but this color is due not to the direct effect of the potash upon color, but to the fact that the leaf surface upon the tree may diminish and thus let in more sunlight. Potash is not a cure for disease. Heavy potash applications may cause the tree to produce a denser wood, increase the sap pressure in the cells and thus make it more difficult for certain diseases to gain a foothold in the tissues of the plant. It has been claimed that potash will tend to increase the sugar content of fruits; but this has not as yet been proven. When potash is applied to a soil that is somewhat deficient in both potash and nitrogen, its effect is to cause the foliage to assume a deeper green color. After a season or two this effect wears off. Yellowness of foliage in an orchard that is well cared for in every way and whose moisture supply is good, may be due to either lack of potash, lack of nitrogen, or both. There is a current belief that potash fertilizers add to the keeping qualities of fruit. There is some evidence to support this view, but it is not as yet conclusive. It is likely that this effect of potash would be more noticeable in peaches than in apples.



Phosphoric acid does not appear to quickly become a limiting factor in fruit production. As a usual thing most soils, except those of the Atlantic Coastal Plains and some alluvial soils of the central states, are fairly well supplied with phosphorus. Phosphorus is a necessary factor in cell division and without phosphorus no growth can take place. In peaches we find that phosphorus tends to slightly delay maturity. This is directly opposite to its effect upon most plants. In most cases the ripening process is forwarded by the use of phosphoric acid.

What the behavior of phosphorus, in this respect, is with apples, I cannot say. We have some evidence that, in peaches at least, too much phosphoric acid may seriously interfere with proper pollination of the blossoms and thus lessen the set of fruit.

Lime may be a limiting factor in apple growing, but it is my opinion that such cases are rare.

Stewart found in Pennsylvania that potash in combination with other fertilizers increased the size of fruit to some degree. His results coincide with our own experience in fertilizing peaches.

There are other elements of plant food that may be limitless in certain isolated cases. Of these, magnesia and sulphur are the most likely to be so, although recent work with vegetables and grains would indicate that some soils are deficient in sulphur. Iron is necessary to all plant growth, but practically all orchard soils are sufficiently supplied with this element. Silica, sodium and aluminum are probably present in great quantities in all soils and we need pay no attention to them.

No general fertilizer treatment can be recommended for the apple crop. The orchard in question may need it or it may not. Oftentimes it is advisable to apply readily available plant food to young trees, although the soil may be plentifully supplied. Such treatment will enable the young tree to quickly establish itself. After being once established and given an impetus for growth, it may not be necessary to add any more fertilizers.

The wise thing to do before resorting to the use of fertilizers, either commercial or barnyard manure, is to be sure that all limiting factors other than potash, phosphoric acid or nitrogen, are under control. This would mean that the moisture supply should be properly regulated either through drainage, irrigation or maintaining the humus content of the soil. I believe that

failure to properly regulate the moisture content of the soil is responsible for more failures in growing apples than any other one thing. Moisture content of soils has a direct correlation with the cultural methods used in the orchard. Plant food may be present in sufficient quantities to grow an orchard profitably for a hundred or more years. Proper moisture conditions of the soil are necessary to make plant food soluble and available. Humus is an all important factor in handling orchard soils and no apple grower should neglect this point.

The disease and insect factor is also important and the apple grower should use all his resources to bring the injury from these causes down to a minimum. If an orchard has a well regulated moisture supply, if it has been properly pruned, properly sprayed and properly cultivated, and then the trees fail to do their best, then and not until then should the apple grower resort to the use of commercial fertilizers. When he does use commercial fertilizers, he should endeavor to ascertain what particular element is the one lacking.

I believe that, in many cases, what we need is not orchard fertilization but tree fertilization. There may be individual apple trees in the orchard that are not growing right or not bearing right and the grower's efforts should be directed toward these individual trees rather than to the orchard as a whole. The trouble may be in wet feet, leachy soil, disease, or insufficient plant food.

I believe that every grower of fruit should keep a record of the individual behavior of his trees. It will require only a few hours' work two or three times a year and in this way he can pick out the star boarder trees. A shovelful of nitrate of soda may change a sickly tree into a profitable one, or a few pounds of potash may change the whole bearing qualities of a tree.

I hope that I have been able to show you why I believe that those who oppose the use of commercial fertilizers and that those who advocate their use may both be right, and that they may both be wrong. It all depends upon the orchard under consideration. Because one man never needs the services of a doctor is no argument that another man does not. Apple trees are living plants and subject to the same fundamental laws of nutrition as other plants. The proper application of the facts may vary, but the fundamental fact remains a fact, nevertheless.

## ANNUAL BUSINESS MEETING, THURSDAY, NOV. 19.

Meeting called to order by President Conant.

The following committee on resolutions was appointed by the president: John W. True, J. A. Roberts, Lyman K. Lee.

The secretary read a letter received from the American Pomological Society, asking that the Maine State Pomological Society elect a state vice president of the American Pomological Society.

Voted, that this letter be received and that a vice president be elected.

The secretary read invitations to hold the annual meeting of 1915 in their respective cities, received from the Waterville chamber of commerce and the Portland board of trade.

It was voted that these invitations be referred to the executive committee.

All the members of the committee on storage having resigned, there was no report from that committee.

As none of the members of the committee on transportation were present, no report was received from that committee.

A. K. Gardner made the report for the committee on membership, and it was voted that this report be accepted.

A report was made by Mr. Keyser, the member of the Experiment Station Council.

The report of the committee on resolutions was presented by J. W. True, as follows, and it was voted to accept this report.

Your committee on resolutions recognize the exhibit of fruit at this annual meeting of the State Pomological Society as the largest in quantity and the best in quality in its history.

*Resolved*, That our thanks be extended to President Conant and the other officers of the association for their efficient management of its affairs during the year.

*Resolved*, That we favor the recommendation of President Conant for an experimental cold storage plant at Highmoor Farm, and his recommendation for an increased appropriation by the legislature to carry out the provisions of the Apple Grading and Packing Law; also all other recommendations made by him.

We favor and recommend a legislative committee to present these measures to the next legislature, as well as such other

measures as this body or the committee may deem advisable, to promote the orchard industry of the state. The president of this association shall be chairman of the legislative committee.

We are in thorough sympathy with the extension work of the College of Agriculture under Dean Leon S. Merrill. This work is of great educational value to the people of the state who are interested in better farming. We recommend its extension into all counties and parts of the state, and that the legislature be asked to grant such appropriations as may be necessary to secure the full appropriation made by Congress.

*Resolved*, That this society extend its thanks to the City of Bangor and to the Bangor chamber of commerce for their invitation to hold our annual meeting in this city, and for their contributions and the contributions of the citizens of the city which have helped make the exhibition entirely successful.

We thank the railroads for favorable rates.

We thank the press for extended and favorable notices of this meeting.

We thank the College of Agriculture and the Maine Agricultural Experiment Station for their great assistance in making the exhibition successful.

JOHN W. TRUE,

J. A. ROBERTS,

L. K. LEE,

*Committee on Resolutions.*

On motion of Mr. Keyser, duly seconded, it was voted that a committee of two be appointed to act in connection with the president of this association as a legislative committee, and that they be instructed to carry out the recommendations of the committee on resolutions.

The following motion was made by Dr. Woods: "I move that this society use every means in its power to secure such appropriations from the state for the support of agricultural extension work in connection with the Smith-Lever Act as shall take advantage of the provisions of said act to its fullest extent."

The motion being duly seconded, it was so voted.

On motion by Mr. Keyser, duly seconded, it was voted to amend the constitution as follows: In Article II, section 1, change the clause referring to the executive committee, which



now reads,—“and an executive committee, consisting of three members exclusive of the president and secretary, who shall be members ex officio,” so that it shall read as follows:

“and an executive committee, consisting of three members, exclusive of the president, first vice-president, secretary and treasurer, who shall be members ex officio.”

T. E. Chase presented the following report as treasurer, and it was voted that the report of the treasurer be accepted.

## REPORT OF TREASURER

FOR THE YEAR 1914.

### RECEIPTS.

1914.			
Jan.	20.	Interest on Bank Stock.....	\$16 00
		Interest on Bonds.....	22 50
Feb.	4.	From E. L. White, balance on 1913 Advertising Acct. ....	59 50
April	1.	From State Stipend.....	84 85
	13.	From E. L. Lincoln, balance from 1913 business..	252 10
June	30.	Interest on Bonds.....	22 50
July	7.	Interest on Bank Stock.....	16 00
Oct.	3.	From State Stipend.....	251 12
Nov.		From Advertising and Space Acct., Annual Meeting .....	134 00
		From Sale of Apples, Annual Meeting.....	35 00
		From G. R. Cooper Co. for Prizes, Annual Meeting	50 00
		From City of Bangor, for Prizes, Annual Meeting	100 00
		From Bangor Chamber of Commerce, Annual Meeting .....	330 00
Dec.	19.	From State Stipend.....	733 17
	31.	Annual Membership fees.....	90 00
		Life Membership fees.....	140 00
		Loan from Natl. Shoe & Leather Bank.....	300 00
Total receipts .....			\$2,636 74

### DISBURSEMENTS.

#### Orders

No.	1	Elm House, Auburn, Executive Committee Expenses	\$11 50
	2	E. F. Hitchings, expenses.....	4 98
	3	J. P. Stewart, Bulletins.....	5 00
	4	A. L. Newton, envelopes.....	11 16



5	W. W. Brown, postage.....	4 50
6	E. L. Lincoln, expenses.....	2 63
7	E. L. Lincoln, interest.....	8 34
8	Lincoln House, Field Meeting expenses.....	2 00
9	New Chase House, Field Meeting expenses.....	5 00
10	W. F. Dunham, printing.....	1 00
11	F. H. Morse, expenses.....	5 50
12	E. E. Conant, Field Meeting expenses.....	17 58
13	Geo. A. Yeaton, Field Meeting expenses.....	4 05
14	Auburn Free Press, printing.....	2 50
15	Forest House, Monroe, Field Meeting expenses.....	5 00
16	Harry W. Littlefield, Field Meeting expenses.....	2 15
17	Geo. A. Yeaton, Field Meeting expenses.....	4 13
18	E. E. Conant, Field Meeting expenses.....	14 21
19	W. H. Conant, Field Meeting expenses.....	15 27
20	F. H. Morse, Field Meeting expenses.....	9 25
21	Paid direct by State Treasurer from stipend.....	3 00
22	E. L. White, expenses.....	28 69
23	E. L. White, Secretary, 6 mos. salary.....	75 00
24	Elm House, Auburn, expenses Executive Committee	11 00
25	J. P. Hutchinson & Co., bond for Treasurer.....	5 00
26	Lewiston Journal Co., printing.....	18 27
27	Chas. E. Nash & Son, printing.....	5 20
28	E. F. Hitchings, expenses.....	6 90
29	Maine State Book Binding Co.....	34 45
30	W. F. Dunham, printing.....	5 00
31	Maine Central R. R., freight.....	1 62
32	Edward H. Forbush, speaker, Annual Meeting.....	40 30
33	Lewiston Journal Co., printing, Premium lists.....	37 91
34	G. B. Derby Co., trucking.....	2 25
35	Mrs. G. M. Seavey, on preserves.....	70
36	B. S. Brown, Judge, Annual Meeting.....	26 90
37	Mrs. J. I. Robinson, canned fruit.....	1 00
38	Miss E. R. Freeman, expenses.....	3 15
39	Banquet tickets for speakers and guests.....	18 00
40	H. C. Chapman Hotel Company, expenses, officers and speakers .....	122 25
42	Geo. A. Yeaton, Judge .....	28 38
43	Leland Whipple, photos.....	7 00
44	J. H. Putnam, speaker.....	35 56
46	W. Saxby Blair, speaker.....	60 00
47	Nellie M. Leland, Judge.....	4 00
48	C. A. McCue, speaker.....	64 16
49	O. B. Griffin, speaker.....	29 10
50	M. B. Chapman, Secretary's Asst. expenses.....	12 53
51	W. H. Conant, expenses.....	40 03
52	W. F. Dunham, printing.....	3 27
53	C. L. Gold, Judge.....	54 25

54	E. L. White, expenses.....	21	97
55	E. L. White, 6 mos. salary.....	75	00
56	W. W. Brown, postage.....	39	83
57	E. F. Hitchings, Judge.....	25	00
58	Mrs. E. C. Patten, damage to canned fruit.....	50	
59	Leon S. Merrill, Federation dues.....	6	00
60	T. E. Chase, Treasurer, salary and expenses.....	37	62
61	Bangor Chamber of Commerce—tables, labor, etc., Annual Meeting .....	44	50
62	Premiums paid by the Society.....	692	50
	Special premiums .....	480	00
63	Mrs. W. G. Conant, Judge.....	2	00
64	Geo. F. Dunham, freight.....	2	17
65	Merrymeeting Grange, storage.....	1	00
66	Miss L. B. Raynes, stenographer.....	58	05
67	H. L. Keyser, expenses.....	8	25
68	F. H. Morse, expenses.....	11	20
69	W. H. Conant, envelopes.....	21	30
Nov. 20.	L. P. Patten, carpenter work.....	57	44
Jan. 12.	Elm House, Auburn, Executive Committee expenses Interest on note.....	3	75
		3	00
Dec. 31	T. E. Chase, postage.....	5	00
	Lewiston Journal Co., envelopes, etc.....	25	73
	Lewiston Journal Co., programs.....	45	00
Total expenditures .....		\$2,584	43
Cash on hand .....		52	31
		<hr/>	
		\$2,636 74	

Permanent fund for the year 1913.....	\$2,130 00	
Due for transfer to permanent fund.....	140 00	
Total .....	—————	\$2,270 00
Permanent fund invested as follows:		
Four shares stock First National Bank, Farmington.....		\$400 00
Two bonds, Stockton Springs.....		970 00
Deposit in Savings Bank.....		760 00
Due for transfer to permanent fund.....		140 00
		—————
Total investments .....		\$2,270 00

Respectfully submitted,

THOMAS E. CHASE,

*Treasurer.*

## REPORT OF SECRETARY.

During the year the executive committee has been called together three times. At the first meeting, held in Auburn, the

work for the year 1913 was closed and matters in regard to the work for 1914 were taken up.

A communication from the American Pomological Society was referred to our next annual meeting.

Voted to accept the invitation from the Bangor Chamber of Commerce, provided that President Conant and Mr. Keyser could make suitable arrangements.

The secretary was instructed to purchase two hundred bulletins on Fertilization of Orchards, by Prof. J. P. Stewart, and to distribute them among the fruit growers of Maine. (Only fifty could be procured, which were mailed to a few of the fruit growers of Maine.)

The matter of field meetings was left with the president and secretary.

Voted to have the treasurer give \$1,000 bond.

The second meeting of the executive committee was called to meet in Auburn, February 24. The premium list was revised and other matters in regard to our field meetings were talked over.

The first field meeting was held in the Grange hall, Cornish, April 15. The following program was carried out:

George A. Yeaton gave a talk on setting, grafting and pruning of orchards.

F. H. Morse spoke on spraying; E. E. Conant, on foreign markets, and W. H. Conant, on cultivation of orchards and co-operation.

A good many questions were asked and an enthusiastic meeting was enjoyed by the one hundred and twenty-five that were present.

A second field meeting was held in the Grange hall, Monroe, with the following speakers:

G. A. Yeaton, on pruning, grafting and the treatment of apple tree diseases; W. H. Conant, on cultivation and fertilization; A. K. Gardner, on advertising the apple; H. P. Sweetsir, on spraying; Prof. B. S. Brown, on box packing; E. E. Conant, on foreign markets.

There were seventy-five people in attendance who were interested along the lines of fruit culture and many questions were asked of the different speakers.

The third meeting of the executive committee was held in Auburn, August 13, when important matters relating to our annual meeting in Bangor were discussed and acted upon.

The membership of the society is on the increase.

It would be a great help to the work of the secretary if full post office address was given at the time of joining, and if he were notified in case of change of address.

The last meeting of the Pomological Society attracted a great deal of attention outside of the state, as requests for the proceedings were received from different parts of the United States.

With Maine's large crop of apples and the present market conditions, it is only by persistent and patient efforts on the part of the growers that they will be able to get their just returns.

Respectfully,

E. L. WHITE,

*Secretary.*

Voted, that the report of the secretary be accepted.

The following officers were elected for the ensuing year: President, Wilson H. Conant of Buckfield; first vice president, George A. Yeaton of Norway; second vice president, Lyman K. Lee of Foxcroft; secretary, E. L. White of Bowdoinham; treasurer, Thomas E. Chase of Buckfield; member of executive committee for three years, F. H. Morse of Waterford; member of Experiment Station Council, Howard L. Keyser of Greene; vice president or representative to the New England Fruit Show, Wilson H. Conant of Buckfield; state vice president of American Pomological Society, Howard L. Keyser of Greene.

A suggestion was made by L. K. Lee that the society offer an additional prize in connection with the Gregory contest, and on motion, duly seconded, it was voted to leave this matter in the hands of the executive committee.

On motion, duly seconded, it was voted that the member of the Experiment Station Council serve as a visitor to the College of Agriculture.

EXPERIMENTAL WORK IN NOVA SCOTIA,  
RELATING TO APPLE SCAB CONTROL.

PROF. W. SAXBY BLAIR, Kentville, N. S.

*Mr. Chairman, Ladies and Gentlemen:*

It gives me great pleasure to have this opportunity of meeting with the Maine fruit growers. I have heard about the progress that is being made in Maine in the development of the fruit industry, and certainly it is a pleasure to come here and see the excellent fruit you are putting up. We in Nova Scotia feel that you have a good fruit country, for we come in competition with your fruit in our exports to the old country, and we know right well that you know how to put up a good class of product. Like ourselves, you are pushing ahead and trying to develop the very best quality of fruit that you possibly can, and no doubt you feel that you cannot get too much help from outside sections in order that you may make a still greater success of the fruit business.

In connection with our experimental work in Nova Scotia, the Dominion Government a few years ago decided that a fruit station in the Annapolis Valley would be a good thing for the fruit growers. The fruit area of Nova Scotia, as many of you know, is confined to the three counties which are located between the North and the South mountains. These mountains give a certain protection to the valley between, and in this region the bulk of the fruit is grown. Large orchards have been planted and the orchard area extended until at the present time we export annually about a million barrels of apples. These apples we think are of exceptionally good quality. In connection, then, with the development of this industry, this fruit station was established at Kentville, N. S., as part of the Dominion experimental farm's line of experiment stations, and I am in control of the work there. As this is a new station and no mature orchards are available on it for experimental work, authority was given that we should carry on a certain number of experiments in a section of each of the counties, Kings, Hants and Annapolis. We have, therefore, for two years, been experimenting to determine if possible what are the best sprays for the control of apple scab, what time the sprays



should be put on in order to get the best results, and what combination of sprays will give us the best fruit.

To begin with, we found that a number of fruit growers are not getting profitable results in connection with their spraying operations. They were spraying thoroughly, apparently, and yet their fruit was not of the quality that we would like. A great number of growers said that we could not possibly expect to get clean fruit with the use of lime-sulphur. They had been able to get clean fruit with the use of Bordeaux, but they had burning of foliage and rusting of the fruit so that they were not satisfied with the use of Bordeaux for the control of scab. And yet, when they used lime-sulphur they did not get the results they anticipated.

Our first experimental work then consisted in determining whether lime-sulphur would control scab equally as well as Bordeaux. And we have found from our experiments carried over two years, at least, that these two materials have equal value as fungicides. As a summary of our experiments, we find the following:

For 1913		% Scab.		
Bordeaux	.....			7.2
Lime-sulphur	.....			5.37
No spray	.....			59.6
		Gravenstein	Spy	G. Russet
For 1914.		% Scab.	% Scab.	% Scab.
Bordeaux 3-3-40	.....	0.09	1.34	.16
Bordeaux 4-4-40	.....	0	.32	0
Lime-sulphur 1.008	.....	.63	0	.5
No Spray	.....	18.47	30.77	5.28

Bordeaux made up of 3 lbs. lime, 3 lbs. copper sulphate, with water to make 40 gallons of mixture; also 4 lbs. lime, 4 lbs. copper sulphate with water to make 40 gallons of mixture, were compared with the usual strength of lime-sulphur, 1.008, specific gravity, or 1 gallon commercial concentrate to 34 gallons of water. Two pounds arsenate of lead to 40 gallons was added to each of the above mixtures. The application was made on all the plots on the same date. Two applications were made before the blossoms opened and two after. Gravenstein, King, Ribston and Ben Davis were included in the 1913 test.

RUSSETING OF FRUIT CAUSED BY BORDEAUX ARSENATE AS  
COMPARED WITH LIME-SULPHUR ARSENATE.

In order to determine the amount of russeting caused by the use of Bordeaux arsenate as compared with lime-sulphur arsenate, plots were sprayed on the same date and records obtained with the following results:

	% Russet.
1913	
Bordeaux .....	71.47
Lime-sulphur .....	2.5

The above is the average of various experiments, including the Ribston, Ben Davis, King, Spy and Gravenstein. Our results for 1914 are very similar and indicate that russeting from Bordeaux may cause considerable loss if a high class product is to be obtained.

1914	% Russet. Gravenstein	% Russet. Spy
Bordeaux, 3-3-40 .....	84.35	1.15
Bordeaux, 4-4-40 .....	81.08	1.9
Lime-sulphur 1.008 .....	3.03	.23

Comparing the Bordeaux with lime-sulphur fruit in the packed out results we find a decided loss from the russet caused from Bordeaux, which was as follows:

Loss in Gravensteins per 100 bbls.....	\$33.01
Loss in Ben Davis per 100 bbls.....	31.29
Loss in Ribston per 100 bbls.....	39.41

That is, the fruit may have been as large, the fruit was as clean, but the loss resulted from the fact that we had a certain number of apples russeted, and those badly russeted could not be put into the No. 1 class and had to go as No. 2 or 3, and consequently brought a lower price. I am just bringing this to your attention for this reason, that it is not so much a question for us as to whether the one is better fungicide than the other, but it is a question whether we can get more dollars out of our fruit by using one material rather than the other. And from the experiments we have carried on so far we find that if we wish to get the greatest number of dollars possible out of our fruit it is much better to use the lime-sulphur than the Bordeaux.

Question: How did Bordeaux affect the foliage?

PROF. BLAIR: In the case of the King apples we had very severe injury to the foliage in one of our orchards in 1913, which was noticeable throughout the whole season. In another orchard at Bridgetown the injury was not nearly so apparent; in fact, the foliage during the first part of the season on the trees that were sprayed with Bordeaux was much healthier looking than that on the trees sprayed with lime-sulphur, but this condition reversed before the end of the season, and the lime-sulphur foliage was better on the trees than where Bordeaux had been used. This year we took particular notes as to the foliage conditions and we could not notice any particular difference between the lime-sulphur and the Bordeaux foliage. Consequently we concluded that the climatic conditions that followed the application of Bordeaux, and the condition of the tree and the health of the tree, are all factors as to the amount of injury that may result from the use of Bordeaux.

#### BORDEAUX BEFORE BLOSSOMS OPEN VS. LIME-SULPHUR.

These tests were conducted on a block of Gravensteins at Berwick and were for the purpose of finding out whether Bordeaux applications before the blossoms opened would control scab equally as well as lime-sulphur. All the applications after the petals fell were lime-sulphur 1.008 and applied at the same date. The sprays before the blossoms opened were on the same date.

Sprays before blossoms opened.				% Scab.
	April 25	May 18	May 28	
Dormant.				
Lime sulphur..	1.014	1.008	1.008	4.3
No Dormant...		1.008	1.008	5.52
Bluestone . . . .	1 to 15	4-4-40	4-4-40	5.64
No dormant...		4-4-40	4-4-40	1.8
Bordeaux . . . . .	4-4-40	4-4-40	4-4-40	.63
Bordeaux . . . . .	3-3-30	3-3-40	3-3-40	5.51
Bordeaux . . . . .		3-3-40	3-3-40	No Fruit
No Spray.....				68.21

#### THE VALUE OF THE DORMANT SPRAY FOR CONTROL OF APPLE SCAB.

Experiments were carried out in each of the experimental orchards to determine the value of the dormant spray, in addition to the usual sprays for the control of scab. The only difference in application in these plots is that in Berwick a spray

of 1.014 specific gravity, or 1 to 20 (1 gallon Commercial concentrate to 19 of water), and in the other orchards a spray of 1.028 or 1 to 10 (1 gallon of commercial concentrate to 9 of water) were applied when the trees were dormant the latter part of April. After the dormant spray was applied all plots were sprayed alike and on the same date with the usual lime-sulphur arsenate spray, two applications before blossoms open and two after. It will be seen that in this test the dormant spray was of little value for the control of scab.

Gravensteins at Berwick.	% Scab.
Dormant and regular sprays.....	4.3
No dormant, regular sprays only.....	5.52
No spray .....	75.44
Kings at Berwick.	
Dormant and regular sprays.....	1.06
No dormant, regular sprays only.....	0.00
No spray .....	34.91
Russets at Falmouth.	
Dormant and regular sprays.....	2.67
No dormant, regular sprays only.....	4.71
No spray .....	37.74
Ben Davis at Falmouth.	
Dormant and regular sprays.....	.61
No dormant, regular sprays only.....	1.2
No spray .....	30.35
Gravensteins at Falmouth.	
Dormant and regular sprays.....	.4
No dormant, regular sprays only.....	1.35
No spray .....	52.22
Kings at Falmouth.	
Dormant and regular sprays.....	.96
No dormant, regular sprays only.....	1.63
No spray .....	38.37
Gravensteins at Bridgetown.	
Dormant and regular sprays.....	.45
No dormant, regular sprays only.....	1.70
No spray .....	54
Average.	
Dormant and the regular sprays.....	1.49
No dormant, regular sprays only.....	2.30
No spray .....	46.14

## A COMPARISON OF LIME-SULPHUR SPRAYS OF DIFFERENT STRENGTH.

In order to determine whether a lime-sulphur spray stronger than that usually advised is necessary, a series of tests were conducted on a Spy block in Berwick, using 1 to 30, 1 to 35, and 1 to 40 strength throughout the season. Arsenate of lead, 2 lbs. to 40 gallons, was used in each case. It would appear that the 1 to 40, or the one having a specific gravity test of 1.007, is practically as effective as the stronger lime-sulphur. Three applications were made, one just before the blossoms opened, June 2, and two after, June 23 and July 10.

	% Scab.
1.009 specific gravity test, or approximately 1 to 31...	0.18
1.008 specific gravity test, or approximately 1 to 35...	0.15
1.007 specific gravity test, or approximately 1 to 40...	0.49
No spray .....	73.27

## A COMPARISON OF LIME-SULPHUR ARSENATE OF DIFFERENT STRENGTHS FOR THE FIRST SPRAY.

To find out whether a strong lime-sulphur spray for the first application will control scab better than a weak one a series of tests were made on Kings and Gravensteins at Berwick, and on Baldwins at Bridgetown. The trees were sprayed three times and the difference in strength of mixture was confined to the first spray before the blossoms opened, May 28. The applications following this were alike. The results obtained were as follows:

Kings.	% Scab.
1.014 Specific gravity, or 1 to 20.....	.77
1.009 Specific gravity, or 1 to 31.....	1.92
1.008 Specific gravity, or 1 to 35.....	1.07
No spray .....	34.91
Gravensteins.	% Scab.
1.014 Specific gravity, or 1 to 20.....	0.61
1.008 Specific gravity, or 1 to 35.....	5.52
No spray .....	60.98
Baldwin.	
1.014 Specific gravity, or 1 to 20.....	0.56
1.008 Specific gravity, or 1 to 35.....	1.32
No spray .....	22.5



# VALUE OF ARSENATE OF LEAD IN LIME-SULPHUR FOR CONTROL OF SCAB.

Arsenate of lead added to the lime-sulphur spray is considered to greatly increase its fungicidal value. A series of tests to get additional information as to the actual gain from its use for the control of scab was undertaken. Arsenate of lead is necessary for the control of insects and for this reason cannot be left out of our sprays. Its value as a fungicide has not, however, shown up very great in these experiments.

All plots were sprayed at the same time, May 25, June 20 and July 6, with the same strength lime-sulphur, 1.009 specific gravity, for the first spray and 1.008 for the next two applications. This test was conducted at Falmouth.

ARSENATE OF LEAD TO 100 GALLONS OF LIME-SULPHUR.	Golden Russet. % of scab.	Ben Davis. % of scab.	Gravenstein. % of scab.	Ribston. % of scab.	King. % of scab.
7½ lbs. neutral lead .....	4.33	1.31	.06	1.19	no fruit.
5 " " .....	2.55	.47	2.02	.94	
5 " acid lead .....	4.71	1.2	1.35	no fruit.	1.63
2½ " neutral lead .....	1.9	.16	2.12		no fruit.
2 " dry lead .....	3.42	.00	.58	.51	.67
Lime-sulphur only .....	3.54	1.17	6.12	1.09	1.37
No spray .....	no fruit.	23.72	52.33	no fruit.	34.56

# COMMERCIAL CONCENTRATE VERSUS HOME BOILED CONCENTRATE LIME-SULPHUR.

Eight different experiments were conducted with home boiled concentrate and commercial concentrate lime-sulphur applied at the same strength, 1.008, with arsenate of lead added. One application was made before the blossoms opened and two after. The following is a summary of the results.

	% Scab.
Commercial concentrate .....	1.38
Home boiled concentrate .....	.94
No spray .....	50.8

# WHICH SPRAY IS THE MOST IMPORTANT.

In order to determine if possible the relative importance for scab control, of the different sprays, a series of tests were made at Berwick. Lime-sulphur arsenate of the same strength was

used throughout. It would appear that the most important spray this season was that just before the blossoms opened, and the second of importance just after the petals fell. Last season it was the one just after the leaf buds opened which gave the best results and the one just before the blossoms opened was of second value. The results obtained are as follows:

*King Trees at Berwick.*

Application.	% Scab.
Two before, and two after blossoming.....	0.00
Two before, and one just after blossoming.....	1.51
Two before blossoming.....	2.98
One just after leaves expanded, May 18.....	20.66
No spray .....	34.91

*Gravenstein Trees at Berwick.*

Application.	
Two before, and one just after blossoming.....	1.12
Two before blossoming.....	8.50
One before blossoming, just after leaf buds expanded, May 18 .....	51.79
One just before blossoms opened, May 28.....	9.51
One just before blossoms opened, and two after...	2.28
One of Bordeaux 4-4-40, just before blossoms opened, and two after .....	1.21
No spray .....	62.22

In 1913, experiments at our Falmouth orchards resulted as follows:

Date of spraying.

May 9, May 20, June 11, June 23, July 14.....	3.52
May 20, June 11, June 23.....	20.54
June 11, June 23, July 14.....	83.63
No spray .....	87.35

Question: How did the weather conditions compare?

PROF. BLAIR: This year we had cool weather conditions during the early part of the season, later warm and the trees came into blossom much more rapidly than the previous year. I should judge the weather conditions were more normal than last year.

Question: Do you use soluble sulphur?

PROF. BLAIR: Yes, we used soluble sulphur this year in some of our experimental plots. We had a considerable burning on some of the plots. We used it just a little stronger than it is recommended, to find out just the effect on the foliage if farmers should use a little too much, and we had a little burning. We did that for the purpose of pointing out the desirability of using every care in the handling of this material. You can however, use Barium Chloride which, if mixed with the soluble sulphur spray, will to a very large extent do away with this possible injury. We did not get as good control of scab, but that might have been due to the fact that our tests were not complete enough.

Question: How much do you put on?

PROF. BLAIR: We try to get the foliage covered. If you are using a pump with considerable force such as the Bean pump, you are bound to get considerable drip; with the Air-tight or Pittsburg you can give your trees a nice coating without much drip.

Question: What are your results, whether the trees drip or not?

PROF. BLAIR: I am sorry to say that we have no data on that. A lot of our fruit growers think that unless they get the trees to drip they do not get an even application. I don't see how it is possible to spray a tree with the average spray pump without getting a very heavy dripping.

Question: Doesn't it run to the point of the leaves where it drips?

PROF. BLAIR: It is bound to. You cannot avoid that; I do not know of any way to avoid it, except with your mist spray.

Question: How heavy pressure do you use?

PROF. BLAIR: Two hundred to two hundred and twenty-five. With the Bean pump, 225 lbs. or, with the air-tight steel tank Pittsburg pump, we run about 85 lbs. We have been using the Pittsburg pump in some of our experimental work this last year.

Question: In this control of scab, do you take into consideration a rain storm? Would you spray just before a storm if you knew it was coming on?

PROF. BLAIR: Spray just after a rain. If it rains and washes the spray off we do it again. It is hardly safe to run your

chance in such a case. We like to be sure, even if we have to do it a second time.

Question: I would like to ask if you would not get about the same results in spraying with a low pressure pump, that is, 80 lbs., if you had a fine disc, forcing the spray through it, as you would with a 200 lb. pressure with a larger disc.

PROF. BLAIR: What we figure on is the amount of surface that we can cover in a given time. We cannot afford to spend that much time. When you have a small disc you will only get so many gallons with the 80 lbs. pressure, in a certain time. We are not satisfied, and want larger discs and more pressure.

Question: You cut down your capacity?

PROF. BLAIR: Yes, the whole idea of the bigger outlet and the power is to put on instead of 500 gallons in a day, 1200 gallons in a day or more and get the work done. Where we have our large orchards we have to figure on that very closely.

Question: Doesn't it run off the upper part of the leaf, leaving it on the tip entirely?

PROF. BLAIR: You will have a heavier coating on the tip, but still you have a coating above, just the same.

Question: Enough so it shows very plain?

PROF. BLAIR: Well, it will show. It will not show very plain, but so that you can notice a coating there. I do not see that it is necessary that there should be a very thick coating, except that if you have a heavy coating when the leaf is quite young it will be reasonable to suppose that it would give you longer protection, because, as the leaf expands the coating must gradually get thinner, hence the importance, or what we thought was the importance, of using a greater strength for the first sprays in order to give us the necessary protection over a longer period.

Question: Your figures on the arsenate of lead, were they on the dry or wet arsenate?

PROF. BLAIR: The figures that I have given you were for the most part paste arsenate.

Question: Did you use dry and wet, pound for pound?

PROF. BLAIR: No, no, 5 lbs. paste to 100 gallons, 2 lbs. dry to 100 gallons.

Question: That is what I was getting at. I would like to ask how this pump is made that gives you the same result at 80 lbs., as the old pump at 200. That is a new thing to me.



PROF BLAIR: If you write to the Air Tight Steel Tank Co., Pittsburg, Penn., they will send you a catalogue. The whole thing is simply this, the liquid is forced out under a certain air pressure and then there is another lead of hose to carry the air up to the nozzle, and as the liquid emerges through the nozzle at, say, 80 lbs. pressure, this air jet at 80 lbs. pressure strikes the liquid and assists in making it into a mist. We think a whole lot of the pump but it may not be better than some of the others.

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### SMALL FRUIT CULTURE.

By J. H. PUTNAM, Litchfield, Conn.

I am glad to come up here today and to bring to you the greetings of the Connecticut Pomological Society.

I have been asked to speak on the subject of small fruits. The interest in fruit growing has increased at a tremendous rate in the last few years. Especially in apples and large fruits has this been so. But this means also an increase in interest in the small fruits, because lots of these large fruits don't pay at first. While the orchardists are waiting for the large fruits to come into bearing they want to produce something that will give them quick returns, and they become interested in small fruit growing. I think we need not be afraid of this. While this year there may seem to be a little over-production, we need not be afraid of this sweeping enthusiasm in fruit growing which is going on all over the country.

Bacon wrote, "When ages grow to civility and elegance, men come to build stately sooner than to garden finely, as though gardening were the greater excellence." History has proved this to be true. It is only when the development of the sciences gives us the keys to nature's secrets, when the study of the fine arts has created a refined taste, and when the development of manufactories and the extension of commerce have created the wealth to purchase, that the united application of art, science and distribution to agriculture gives us the finished product of the modern skilled fruit grower.

In the growing of fruit the first thing to be considered, as in any other business, is the man, the individual. Some people



think it requires a knack. Now, it does not, but it requires care. You can all remember some old farm house where there seem to be no conditions favorable for the growth of plants, but the little old lady who lives there—or it may be a young lady, or even a little child—has them in her window, waters them carefully, and puts papers around them to protect them when the mercury goes down. You would say, “Why, she can never make plants grow there,” but some day the last of winter you drive by and her windows are filled with blooms, many more than you will see in fine, warm, steam-heated houses where conditions are better, and you say, “Why is it?” I can tell you. It is because this old lady loves her plants. She knows what they want and she does the best she can to supply their needs. It is the sentimental fruit grower that is going to be successful. The fruit grower must get into communion with his plants. Not every man is such a man, but every man who is willing to give attention to details, and is willing to work hard, and is willing to smile when he finds that the weather has practically spoiled his products,—such a man is going to make a success of fruit growing.

Now I haven’t anything new to tell you about growing small fruits. A good many of you here probably know more than I know, after having had speakers come before you for twenty years and tell you all there is to tell about growing small fruits. I am a great deal like the frog who found himself in a can of milk that a farmer shipped to market. Now this frog was very much afraid that he would be drowned, but determined to do all in his power to prevent such a disaster. He found it pretty hard work to keep afloat, but he kept paddling, paddling, and by and by he churned the milk into butter, and he floated into Boston on a good big lump of butter, placid and content. Perhaps if we keep agitating a little, we can get something out of this after all.

The first fruit which comes on and the one which is the most enjoyable, coming with a freshness which the apple has ceased to have, is the strawberry, one of the most valuable of all the small fruits. Nothing can beat the strawberry in its season. This fruit very fortunately lends itself to a variety of soils. Different varieties require different soils and if you will only get the right kind of variety, you can hope to grow the straw-

berry fairly well in any reasonably cultivable soil. A very heavy soil, standing in water, or a very light soil which will persist in drying up as the berry comes on, of course will not grow good strawberries, but in between is a large variety of soils which can be used with good results. As a rule, the early varieties do better on a light soil, and the late varieties do better on the heavy soils.

The preparation of the soil is the first and most important subject, and while we are on that, we might as well say what will cover all small fruits and all large fruits, and all crops as well,—the soil should be thoroughly prepared. I don't believe any of you here ever prepared a plot for any crop so well that when you had finished it you could not have done it better. You cannot prepare a plot too well for strawberries. Never use an old sod if it can be avoided. It is better to cultivate some other crop the first year. A field that has been cultivated the year before with potatoes and then given rye, turned in in the spring, or even left without it, makes a good soil for strawberries. It should be thoroughly prepared and just as early in the spring as you can possibly do it and do it right. But you do not want to plow before your soil is ready. If you do, you pack your soil and you never can break up the lumps. You must not plow too early, but just as early as your soil will work properly.

I am taking for granted that you will set strawberries in the spring. There is no other time to set strawberries for commercial purposes.

The soil should be thoroughly fertilized. Give it a good coat of barnyard manure, and if you haven't enough of that, give it a commercial fertilizer, analyzing about 3-8-10; this will depend on the requirements of your soil. Just before fruiting some use a little nitrate of soda, but be careful or you will get too much foliage growth and a soft berry, more likely to be cut down by blight or rust. If it doesn't start off real well, a little nitrate of soda put on when it is dry so it will not burn the foliage may be beneficial to the crop. But remember the nitrate of soda is likely to give you a larger, softer berry and without the quality you get with more potash and less nitrogen.

Now as to the plants you are going to set. I want good strong plants taken from a new bed. I have little faith in pedigree plants. I think that the selection of strong, mature individuals

will accomplish all that the pedigree will. You should get your strawberry plants from a good, healthy bed, and good, vigorous plants. We are likely to dig a few of the late set runners, that are not good for anything else, for plants. They are not worth much for plants. You should get strong, thrifty ones to start with. Dig up some of your best ones to set.

As to the variety, it depends on the soil requirements and also on your market. For home use you can grow some of the varieties too tender to stand shipping. For market, you have to find a berry that will stand up. For myself, I grow the Marshall for our own use, and for the market, the Brandywine is our standard berry. I was up in Vermont a couple of years ago, speaking about some apples, and I wasn't very well acquainted with conditions there any more than I am here in small fruit culture, so I said, "I don't know what to say about varieties in this particular spot, but it is a pretty sure thing when you are in doubt to plant Baldwins." Whereupon a man in the audience arose and said, "I will have you understand that no Baldwin apple tree ever grew to bearing age in this 'ere country." He was right, and I was recommending the Baldwin apple tree where they would not live to bearing age. So I don't attempt to recommend any particular variety for any particular locality. Plant a few different kinds and find what will grow on your soil and under your conditions.

I like to set the strawberry plants in rows three feet apart, two feet apart in the row, and keep them in a narrow mat. You always get your best strawberries on the outside of the row. Experiments have shown that six inches apart in the row will give the largest yield and best berries. You can plant a wide matted row four feet apart and the rows two feet apart and thin out your runners and get those conditions. It is expensive. You can set them out that distance apart, but it is too expensive—you can't afford to do it. But by setting fairly close and keeping the rows narrow, and in the fall keeping the runners cut out, you can get those conditions, and get good fruit and get it cheaper. We need not only to get good fruit, but at an expense low enough so that we can make a profit on it when we come to sell it. I like the narrow matted row system the best of any. Remember, a strawberry plant is just as much a

weed in a strawberry bed as any other weed after you have a certain number of plants set in the bed.

Question: Regarding varieties, what is your opinion of the fall bearers,—what are termed perpetual bearers?

MR. PUTNAM: Let them alone commercially. If you want to play with them a little bit by yourself, all right. There are a few of those that do fairly well but it costs. You must have the blossoms all off the first crop if you want to get a second crop. As a rule, people will not pay the price for out-of-season produce that it costs to raise it. If you take pains with them, keep them heavily cultivated, and cut off the blossoms early in the season. You will get a few good berries, but as a commercial proposition, I do not believe they will be a success. The same thing applies to the fall bearing raspberry.

Question: How much does it cost?

MR. PUTNAM: You can raise them for twenty-five to thirty cents a basket, I guess, all right, and if you do it after you get through working, at night, you never will miss the cost.

The first year you should keep your strawberries thoroughly cultivated, free from weeds. In the fall, when you can drive on without cutting through the ground you should mulch them. I like straw horse manure for a mulch. Be careful not to put on too much so as to smother the plants. Cover them over and keep them frozen; keep them from thawing. The mulch holds the snow on and keeps them from freezing and thawing alternately,—protects them in that way.

Question. Has the time passed yet to mulch?

MR. PUTNAM: No; up here is a good time now to do it. If I have straw or hay mulch it is pretty likely to blow off, but when the first good snow squall comes on the straw, that snow will hold the straw down well. It will freeze to the ground, and then it will stay all winter. The horse manure may be put on any time when the ground is frozen enough so as to drive over the rows without cutting the strawberry plants.

Now as to picking and marketing. I sort my berries for a special market. All my berries are sorted except the last picking. I can't get pickers that I can trust. They all come to the table and are sorted very rapidly. If your berries are running good you will get almost as many baskets as you had to start with and your baskets of seconds extra which will bring about



as much as the mixed berries. The little ones only fill in between the big ones. This is especially true of the Brandywine. It has a large hull. Sorting is a commercial proposition. It is just the same as with your apples. You know they will bring a great deal more than the apples off the same tree if they were all mixed together.

Question: What is the cost of picking and grading?

MR. PUTNAM: Well, it depends altogether on who does it. I couldn't say just how quickly I can grade strawberries—it depends on how they are running—but I can run over a crate of berries in ten minutes and grade them.

Question: You don't face them up?

MR. PUTNAM: All faced as they go; but we don't handle the berry. We have a packing table which stands about the height of our elbows. The berries are brought in on trays, carrying eight boxes. The tray is a little board with a leg in each corner, slats nailed around the edges and a half of a barrel stave for a handle. They are set on the table as they bring them in. Take one of those boxes, with an empty box in front of you, and pour them out into the other box, and pick out the poor ones as you run them over. If you could have pickers that you could trust, you could have them sort. Now remember, this is wholly for my market. I have a near-by market. Those berries are all delivered within two hours from the time they are picked from the vines, and that is a different proposition from a shipment to Boston or Portland or somewhere else. Of course, then, by handling it may hurt the berries about standing up. If you can trust your pickers to grade them as they pick them, so much the better.

Question: What does this facing consist of? Is it anything more than leveling off?

MR. PUTNAM: No, sir. Our berries have sold in the same market for sixteen years. A man offered me last year sixteen cents a quart for all my berries straight, first and second. And those people know my berries. If I had faced them in the first place they wouldn't be offering me sixteen cents a box for everything.

Some years ago I planted two plots of strawberries and kept exact account of the cost of each from the time of planting until cultivation ceased. This did not take into account the cost



of mulching, the cost of fitting the land, or the manure and fertilizers. One plot was composed of nine beds of four rows each, rows one foot apart, plants one foot apart in the rows and beds two feet apart. This system is commonly known as the Kivet system. This made 4500 feet of land and took 3600 plants. The cost of planting, cultivating and keeping all runners cut off was \$25.10 or at the rate of \$243 per acre for labor of planting and growing. I charged nothing for the plants, simply the cost of digging, trimming and planting, which I found was about 15 cents per hundred. If I had purchased the plants at \$3 per thousand it would have cost \$105 per acre, as it takes 35,000 to plant an acre this way.

The other plot consisted of 1300 plants placed in rows three feet apart and two feet in the row, thus making a little less than one-fifth of an acre, or about twice the amount in the other plot. On one-half of this bed were matted rows and on the other half I placed the runners, letting five set to each old plant and cutting off the rest. The cost of this bed was \$22.10 or \$125 per acre, just about one-half of the other. Of course the cost of growing the matted row half was less than the set runners, but I did not keep separate accounts.

As to the yields, the yield was nearly the same in proportion on the two plots, that is, about 500 quarts on the Kivet bed and 1000 quarts on the other bed of twice the size. The matted rows gave me the most berries and the set runners gave me a little the best berries. This trial was not quite fair as I ran out of plants for the Kivet bed of the varieties I planted in the other and had to use some varieties that I do not consider as good for that method of growing, but after two years' trial I gave up the close planting as not profitable for me. I now practice the narrow matted row for the field and the placed runners for the garden.

For planting, I prefer a good strong mason's trowel to any other implement I have tried. When you dig your plants, pick off all the leaves except one or two. As you pick over your plants and take them up in your hands, twenty-five to the bunch—dip the tops into a pail of Bordeaux mixture and place them in a basket with some moss on straw, for the roots.

Question: Do you cut off the ends of those bunches?

MR. PUTNAM: I do usually, about one-quarter to one-third of the roots; they will throw off fine fibres better.

Question: Do you object to setting with a spade?

MR. PUTNAM: I prefer a trowel to anything I have ever used. A spade is all right.

Question: You work just one man?

MR. PUTNAM: Yes, one man drops the plants ahead for two or three to set. One man, if he is smart, drops plants for three to set. The mason's trowel gives you about the same hole you could get with the spade, and I like to get down on my knees. I like to get my knuckles upon a plant when I set it.

Question: You would rather do that than put your heel on?

MR. PUTNAM: Yes, sir.

Question: Do they set with the spade much in your section?

MR. PUTNAM: Not so very much. They do some. If your ground is perfectly fitted you can set with your hand and set them good, too. You don't need much of anything to dig the hole with if your ground is nice and mellow and right. You want to have the roots thoroughly spread out. Don't set them in a bunch. And they should be set so that every leaf may be pulled off without starting the strawberry plant.

The raspberry comes next in value, I think, as a commercial plant. It will not take quite as heavy or quite as light a soil as the strawberry. It prefers a good corn soil. It will stand wet feet quite as much as some strawberries, and it ripens in the dry time of the year, from July up to the first of August, at a time when you are likely to have a drought, and if you have it on a very light soil your berries are likely to dry up. Your soil should be well fertilized and properly prepared and you should have healthy plants from a healthy field—put that down and stick to it. The first year I like to plough furrows three feet apart right across the field and then plant in every other furrow about two or three feet apart, planting a row of potatoes between, and cultivating as you would for potatoes the first of it, and you get a good crop of potatoes. I don't summer prune my plants. I have been in the habit of laying them down, and if you get a stocky plant you cannot lay it down; you want a long shoot. I have never pinched them back in the summer. The last two years I have not laid them down and have had good success without protection. Remember this point: Cut out

your raspberry canes just as soon as they are through fruiting. I never did in my life, but I ought to do it. Business is rushing so just then that we usually wait and do it in the fall, and in the spring go through and thin down to what we want, cutting back what is winter-killed. This is one way to control raspberry diseases satisfactorily: Keep your bed clean and if you see a cane which shows the least sign of disease, cut it out and burn it.

Question: There is one advantage in our section, with our climate, in leaving the old canes to support the new canes, to prevent their breaking down.

MR. PUTNAM: Let me tell you my method. It may help you. I plant in rows six feet apart with plants four feet and let them make solid rows. I set posts about 25 feet apart and two and a half feet high, and drive a nail in the top. I then stretch a No. 13 wire rather loosely on each side and hook it over the nails. I can easily throw this wire down for pruning and hang it up to keep the plants in for cultivating. You can get second hand telephone wire which will cost almost nothing.

The raspberry has to be marketed very quickly. You people everywhere in New England have a home market more than you think you have if you would spend time in developing it. I have shipped my raspberries away when I could have sold them near home if I had taken the trouble. With the raspberries you sometimes get three days' rain in the middle of your best crop. This ruins them for market, but if you can evaporate them, you can use a big paddle for picking and you can perhaps save your profit on your crop. The small fruit grower has his troubles as have the growers of large fruit. There will be years just as you are getting this year with the apples, when things don't look so hopeful, but on the whole they are a pretty profitable proposition.

The black raspberry is propagated from the tips, otherwise it is handled in much the same way. I think it best to pinch it back. Another thing, in regard to red raspberries,—I never cultivate them after I pick them. I am up 1200 feet, in an entirely different climate from New Haven, and I have to look out for the winter-killing, as you do here. You want to ripen your cane early and get it mature. We are about ten days later than they are at New Haven with their crop. Con-

sequently if, after we finished picking our crop, we cultivated our raspberries and started fresh growth, the canes would not ripen sufficiently. I get my strawberries as late as I can. I am behind the main market of my vicinity, consequently if I tried to get my crop in market early I would get my earliest berries in with their main crop and I would be left no profit. Consequently I keep my berries as late as I can, keeping my mulch on as late in the spring as I can, but not too late or they will burn and heat. You should watch them. I keep them back as long as I can and then I get my main crop in as the other people get the last of theirs in, and the market is mine.

I stop cultivating my raspberries as soon as they begin to ripen, and let the weeds grow, and then I turn a furrow against those raspberries. Perhaps that is wrong theoretically but it has been very successful with me. I do the same with my currants. I turn a furrow from each side right in upon my raspberries and currants. It mounds them and lets the water drain off between them and covers the roots in the winter. Of course it exposes them between. It turns under the weeds pretty well and when you hoe in the spring it leaves your raspberry row pretty clean and easy to handle.

Question: Do you put any fertilizer in that row?

MR. PUTNAM: We spread stable manure through the winter upon this raspberry patch as we can get in there. I was down to Mr. Margeson's in Westwood, Mass., who has ten acres from which he took \$5000 worth of fruit. You can't get in there with a horse and wagon. There are apple trees, plums, cherries, and in between them currants, and every bit of fertilizer comes in on a wheelbarrow. That is intensive small fruit growing. We get the fertilizer, horse manure, on through the winter. In the spring, cultivate and hoe this in between the rows. It works out pretty well for us.

You have to select hardy varieties in the blackberry and raspberry. I use the Herbert and Cuthbert in the raspberry. I am much pleased with the Herbert and confine myself to it almost wholly. The Snyder is the hardiest of the varieties of the blackberry, about the only one I would try to grow commercially. Blackberries should not be nearer than eight feet apart. They should be trellised in the same way as the raspberries, but the posts should be higher. The cultivation of the raspberry



will pretty nearly cover that for the blackberry. It probably pays to spray these cane fruits and your strawberries, too.

Question: How about the Agawam?

MR. PUTNAM: It is a good berry; it is not so hardy as the Snyder.

The currant is one of the most profitable small fruits. It makes a splendid filler for an orchard. It needs a rather heavy soil. It will not do well on a gravelly soil. It needs to be cultivated. The old-fashioned way of letting the currants grow under the garden wall and expecting to get good fruit is just as ridiculous as to grow apples in the pasture. It requires heavy manuring, likewise a little lime in the soil—rather heavy soil. I would set two year old plants. I prefer to set them not nearer than 5 x 5, although I have some set 4 x 4. Prune them the first year or two, cutting back about one-third growth to keep them down, and then cut off some of the old wood each year that has been bearing for two or three years, so you will have some new wood coming along all the time, and you will keep your bushes in pretty good condition. You should spray your currants for the currant worm and of course if you have San Jose scale in your vicinity you should spray them for that. Spray them just the time when the currants are setting—when the petals are falling. That is the time that I find the first worm. You should take him within fifteen minutes or he will get ahead of you. Then I give them a spray of a Bordeaux mixture or 1-50 lime sulphur and 3 lbs. arsenate of lead. If you let them get very big you will spot your currants and they will show it because the arsenate of lead sticks. There is a market for black currants if you make it.

You ought to grow plenty of grapes for the family if you don't care to for market. It is one of the best fruits and we don't appreciate the fact that we can keep grapes for the family for quite a while. You can keep grapes very well if you will take a little pains, in the cellar on slatted frames, and you can grow them well here. If I had time I would like to take up the grape question a little. I don't believe you are growing all the grapes you can in Maine. You cannot grow them on heavy soil. If you have a steep side hill, rocky, with a south slope which isn't worth much of anything else, you can raise good grapes. You should plant the hardy and early maturing varieties.



I want to say, as I have said once before today, that I think we look too far away for our markets. In his famous lecture, "Acres of Diamonds," Russell H. Conwell tells the story of the man who, after a struggle with a refractory collar button, invented the lever button and made a large fortune from the royalties. He had been going around all his life with his fortune under his chin and couldn't see it. We farmers in New England are something like that. We have the good markets here, and they have the money to pay for quality. Let our watchword be "Quality," so when any one buys a New England grown article he will know that it will be fresh and good. And don't put all your eggs in one basket. Grow small fruits along with apples, so if your apples are a glut you will have something else to fall back upon. If we will put the best that is in us into this thing to produce the best quality of fruit that we are capable of producing, many of our farms may be turned into "Acres of Diamonds."

Question: What price do you get for blackberries and raspberries?

MR. PUTNAM: Down there we get about ten cents a quart for blackberries. We have a market at home, where I am. My red raspberries last season averaged right through the season ten cents a pint. At the last I did sell some as low as seven and a half cents when the peaches crowded them. It gives a very good profit on raspberries, I assure you.

Question: What varieties of grapes do you suggest for Maine?

MR. PUTNAM: I don't know the conditions. I am sure you could plant the Green Mountain in this section and I think the Moore's Early. I rather doubt if you could ripen the Concord in many sections here. For a red grape I hardly know which one to say. Your Experiment Station must be able to give you information on varieties which I cannot give you. The Delaware will ripen early if your soil suits it. The Brighton is the best grape we grow. It is one of those grapes which are self-sterile. That is something you should look out for; they will not fertilize their own blossoms, but must have another variety which is stronger. They produce pollen, but the trouble seems to be that the pollen will not fertilize its own blossom. It requires a different strain to fertilize it, so that the cross ferti-

lization of the varieties you have to look out for. I feel pretty sure for your own use you can grow the Green Mountain. You can girdle them and get them earlier that way. Grow it up about three feet high, and save one long leader each way this year. Next year those two will spring out at every bud with side shoots which will set two to four clusters of grapes. One of these leaders you can girdle when grapes are about the size of peas. If you girdle both of them you will lose your vines; you must have some elaborated sap to store in the roots. Girdle half your vine every year and they will ripen from a week to ten days earlier. You will not get the quality if you girdle.

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### PEDIGREE FRUITS.

By PROF. C. A. McCUE, Newark, Delaware.

For the past ten years orchardists and nurserymen have been hearing a great deal about so-called pedigree fruits. The grower of grains is a believer in pedigreed seeds and the "pedigree" is the fetish of the live stock man. The producer of pure bred live stock points with pride to the long pedigrees which his animals bear. He knows the productive record of the ancestors of his animals for many generations back. He banks his all upon "breed." He is a firm believer in the old adage, "Breed is more than feed." As far as animals are concerned every one agrees that the faith placed in the pedigree is faith well founded. Pedigree is not necessarily a correct indication of an animal's performance and worth; but it is an indication of its probable performance and may be regarded as an insurance against mediocrity. Wipe out pedigrees and our live stock industry would fall into a chaotic condition.

Pedigreed seeds are becoming common. Many up to date grain growers and very many vegetable gardeners are demanding that their seeds have a pedigree. Experience and experiment have proven that they are justified in making such a demand. Pedigree seeds are of a necessity based upon repeated selection of the best and ruthless rejection of the mediocre. "It takes three generations to make a gentleman;" but it takes many generations to make a good carrot. The orchardist and the

nurseryman, and especially the nurseymen, have observed with jealous eyes the profits of pedigree breeding in animals and seeds. They have said, if selection and pedigree have done so much for the animal and vegetable industry, why should it not do as much for the fruit industry? If the dairyman can improve his herd by selection from his best producers for breeding purposes, why cannot the fruit grower improve his orchards by taking his scions from trees of known producing powers, and improve his strawberry plantation by taking runners from plants that were high yielders? In short, it has been claimed and preached by many that varieties of tree, vine and bush fruits should have a known pedigree and that such a pedigree would insure betterment in production, quality, vigor, and hardiness of these fruits.

Many well known nurseymen and a few horticulturists of national reputation have endorsed this plan of propagating fruits, while many others, equally as famous, have protested and said that there is absolutely no virtue in it.

We have here a matter of great economic importance to nurserymen and fruit growers. If we can select scions and buds that will give superior fruit, our fruit and nursery business ought to be reorganized along new lines. If we cannot so improve our fruits, we ought to stop talking about pedigree fruits and pedigree nursery stock. The question is of such importance that it ought to be settled quickly one way or the other.

I, perhaps, would better define my own position before going further. It is this: In general, fruit, vines, flowers and other plants are propagated by cuttings, buds, scions, and all other like manner of vegetative reproduction, without the intervention of sex, may possibly be improved by bud selection, but such improvement is rare. I believe that there may be a value in the so-called "pedigreed" nursery stock, but that in the great majority of cases there is absolutely no foundation in fact for the great virtues claimed for such stock. It may appear to you as though I am dodging the issue and trying to play safe, but such is not the fact. I believe unreservedly that as a general practice there is absolutely no virtue in the practice of picking out the best bearing trees in our orchards and propagating from them. I believe that there is nothing of intrinsic value to recommend the practice of cutting scions from bearing trees in

order to propagate nursery stock. The ordinary fruit grower is wasting his time in trying to improve his fruit by bud selection.

The value of "pedigree" nursery stock may be proven or disproven in two ways. First, by experimentation, and second by reasoning. Let us glance a moment at some of the experiments which have been conducted to prove the value of pedigree stock, or "bud selection," as we shall hereafter call it.

George T. Powell of Ghent, New York, is probably one of the leading exponents of bud selection in propagating fruit trees. Let us see what he says. "After twenty-one years' experience in the study of bud variation and in using it in the propagation of fruit trees I believe that there is value in the principle and in its application. I have a King orchard that was top-worked upon Spy bodies with scions selected from a tree that stood for thirty years without any effect from disease, especially the canker which is so injurious to that tree. Ordinarily an orchard of King trees, as propagated from the nursery row, become badly broken in from ten to fifteen years. I chose this method to prove the value of selection, and from the one tree which evidently had constitutional vitality and resistant power against diseases above most trees.

"I have at present a King orchard that has not a trace of disease in it, and which has borne sixteen consecutive crops of excellent fruit. I think there is particular value in bud selection and I believe that buds carry with them specific qualities. However, the tree must be well nourished. The two things must always go together, selection and good culture. After thirteen years of work along this line and with three generations of trees so propagated, now bearing fruit, I feel convinced that the principle is correct, and that it is working out not only highly interesting but most satisfactory results."

Let us examine the facts in the above statements: First, the selected buds were all worked upon Northern Spy stock, which is often used as a stock for King trees to avoid certain diseases. Secondly, there is no check to show that buds from other King trees worked upon Spy stock and under the same cultural conditions might not have given equally good results. But even granting that there was value in this certain instance of bud selection, is it safe to draw generalities from this one case? I think not. I do not deny that much good may come from bud



selection, but I do maintain that such instances are too rare for us to make a general principle out of the behavior of selected buds in one particular instance. Such instances of valuable bud selection are too rare to advise it as a general practice for nurserymen and orchardists.

Let us look at another case. In 1891, The New York Geneva Station planted an orchard of Rome Beauty. The stocks were all carefully selected Ben Davis, and these were budded to Rome Beauty buds that had all been taken from the same tree. Yet an examination of the records of the performance of this orchard shows a great variation in the behavior and growth of the trees. Prof. Hedrick, in writing about these trees, says, "Experimenters, fruit growers and nurserymen are not distinguishing sharply enough between what is due to 'nature' and what is due to 'nurture.'" In other words, the differences found in the behavior of these trees is probably due entirely to their environment and not to their breeding.

Still another experiment, which I must quote largely from memory as I have been unable to locate the reference: Dr. J. C. Whitten, of the University of Missouri, observed a Ben Davis tree in the University orchards that bore more and better (if such a term can be applied to Ben Davis) apples than any other tree of the variety in the orchards. Dr. Whitten propagated a number of trees from this tree. He also propagated a number of trees from the poorest bearing Ben Davis tree in the same orchard. These trees were planted, alternating in the row, and given the same care. After several years of bearing, no differences could be noted between the trees from the heavy producing parent and the trees from the low producing parent.

A number of reliable growers of strawberries have had considerable experience with "pedigree" strawberry plants and the evidence submitted seems to point to the fact that, as far as the strawberry is concerned, there is no benefit to be derived from selecting runners from heavy bearing plants. Just as good bearing plants can be secured by propagating from runners from plants that have a light crop.

Shamel's work in California with citrus fruits would seem to be in favor of the plan of bud selection. Shamel says: "The most astonishing and striking fact disclosed in our studies, and



of tremendous importance in the propagation of citrus trees, is the frequency and character of bud variations in citrus fruits. These are variations in type of trees and fruits such as would come under the head of bud sports or so-called bud mutations. The Eureka Ranch Washington Navel Orange grove of about 150 acres is generally considered the most uniform grove of its kind in the state. The fruit is extremely uniform and there is a complete absence of variable types. This is one reason why the grove was selected for this work. Our study of the trees in this grove has revealed the presence of seven frequently occurring types of the Washington Navel Orange. Five of these types are unproductive, bearing low grade, undesirable, and unproductive fruit. Out of about 13,500 trees we have located about 100 trees of these undesirable types which were rebudded, using buds from select trees of the standard type. These rebudded trees do not represent all of the undesirable type trees present in this grove. Only the most striking and certain cases of undesirable type trees were rebudded. The striking feature of this condition lies in the fact that the trees in this grove were propagated from buds, but shortly removed from the two parent navel orange trees. Bud sprouts as represented in the off type of trees were found in thousands of instances, showing as single branches in otherwise standard type trees, and in our breeding plots where all individual trees are closely studied as single fruits in standard type trees.

"We found many trees in this grove bearing naturally all seven of the general types of the navel orange. Not more than ten per cent, probably less, of the trees of the Standard Washington navel type in this grove are free from off type fruits. This frequent and striking condition cannot be explained on any other grounds than that of bud variation."

Here, indeed, would seem to be an unanswerable argument in favor of bud selection at least for citrus fruits. There is no gainsaying the fact that there is such a thing as bud variation. No two buds upon a tree are exactly alike; all have minor differences. These differences may be caused by an excess or a lack of food, a more favorable position upon the branch, or any of a thousand things. If such variations are permanent and give approximately the same result under all conditions then we have a bud sport. The test of a bud sport is its propa-

gation. We cannot pass judgment upon Shamel's work until we know if the seven types of Washington Navel Orange which he mentions are *permanent* types and if they will "come true" when budded upon other trees. Until this fact has been established we cannot accept Shamel's work as a proof of the value of bud selection in propagating trees. Even though these types should prove permanent we could not accept that fact as proof that bud selection would be the thing to practice in propagating deciduous fruits, such as apples, pears, etc.

The very fact that Shamel found all seven types growing upon a single tree would indicate that his types would fail to "bud true." But we should not judge this work with citrus fruits until it is finished. In dealing with nature it is often best not to prophesy.

Now let us depart from the realms of experimentation and see what reason can do for us in solving this vexatious question of "pedigree" bud selection. In the first place it must be pointed out that the advocates of "pedigree" fruit trees have reasoned from a false premise. They have said: "If there is merit in selecting the best member of the herd to breed from or the best plant in the garden to save seed from, why should we not take our buds and scions from the best fruit trees in our orchard?" Why should we not grasp the benefits of extra quality and heavy production and pass these good qualities on to a new set of trees in a new orchard? There is absolutely no similarity in fact between the first two cases and propagating by buds and scions. In the case of the animal and the seed we have the intervention of sex to reckon with, while in the case of fruit tree propagation by scions, buds or cuttings, there is no question of sex. In the case of seed, we have handed down in the seed a combination of definite characters of the two parents. Since the chance for differing combinations of these characters is great, we consequently expect and do get a great variation in the seedlings from the two parent plants. A bud, a scion, a runner or a cutting is simply a transported portion of the parent plant. Correctly speaking, all the Spy apple trees in the world are simply pieces of the original Spy tree; take them where you may, from Maine, Delaware, Michigan, Oregon or California, and they will still remain Spys.

August Weismann, the noted German scientist, whose decease we noted with regret only a few days ago, was the father of a theory of life that meets with the approval of scientists the world over. Weismann said that all life was composed of two great portions, body plasm and germ plasm. All life has its origin in a simple cell and this cell is composed of these two plasms. One of these, the body plasm, may be modified by environment such as heat, cold, food or other external factors; but these external factors can have no influence whatever upon the germ plasm. All characters that are modified by external causes cannot be passed on to the offspring. Only those characters which are represented in the germ plasm can be carried on from one generation to another. The only way in which the characters of the germ plasm may be permanently modified is by the intervention of sex and the resulting mingling of two different streams of germ plasms. In animals, the germ plasm is centered in the reproductive organs. In plants, it is not only present in the organs of sex but is also, to a great extent, permeates the tissues of the plant. If this were not so we would be unable to reproduce a plant by grafting, budding or cuttings. Some plants show evidence of a wide spread of germ plasm throughout the tissues, while in others its range appears to be greatly restricted. The begonia can be propagated from leaf cuttings while some trees it is hard to propagate in any way other than by seed. Thus we can see that in taking buds or scions from our chosen fruit trees we are simply continuing the old original stream of germ plasm that was in the original plant of the variety. The resulting plants from bud or graft propagation may vary slightly but these variations never fluctuate very far either side of a certain definite type. That is to say, the heritable characters go on from generation to generation of fruit trees without any appreciable fundamental change. We have a great range of variability in the trees, due to external influences upon the body plasm. These variations may take the form of increased production, deeper colors, more vigorous growth, etc., etc.; but such variations are but will-o'-the-wisps, the mere passing whims of nature, who allows the passing wind of environment to ruffle her surface; while, unless sex should intervene, deep down in her placid depths, as represented by

the germ plasm, she goes serenely on her way forever and ever unchanged.

I have said that the germ plasm remains unchanged from generation to generation. However, there are in fact two changes that may occur in it. One change is a slight variation from normal. The pendulum of variation may swing to and fro between two pretty well defined limits, but it always swings about a certain center which is the type of the variety. Any propagation from one of these chance swings of the pendulum will not change its course, it will still oscillate in the same path as before and with the same limits of swing. This form of variation is found in all animal and plant life and a new type cannot be gotten by propagating from any of its variations, even the extreme ones.

It is possible that the seven types of Washington Navel orange mentioned above in Shamel's work are such variations. Here the pendulum of variation has swung through an exceptionally wide arc and has given us such widely varying plants. If such should be the case it would be useless to try to isolate any or all of these seven variations for commercial propagation. The fact that Shamel was able to find all seven types upon a single orange tree would lend color to the argument that they were simple unstable variations. The parent bud from which such a tree sprang must have represented one of these seven types, yet it has produced a tree that has varied widely in the fruits and branches which grew from it. Why should we expect any different results from using any buds from trees representing any one of these types? However, time will tell the truth and it may so happen that Shamel is right and I am wrong.

We have a second class of germ plasm variation whereby new characters may suddenly appear and these characters may be inherited. These are the variations that Darwin called sports, a term which DeVries, the Dutch botanist, has since dignified by the term mutations. De Vries has set forth the theory that plants and animals may suddenly and permanently vary by either adding an entirely new character or by dropping an old character in such a manner that the organism appears in a new dress. During this process of mutation the parent type remains unchanged. I question very much if new characters unknown to the parent type are ever added in such mutations, although



it is not an uncommon phenomenon to have an old character dropped. For illustration, in the nectarine we have nothing more or less than a peach in which the character of "fuzziness" on the fruit has been suddenly lost. If, on the other hand, we should find a plum that suddenly "took on" the character of fuzziness of fruit we would have a true progressive mutation. I doubt if such a similar case will ever be found.

Variations of the first class, that is, variations that are not heritable, are common, and, as we have shown, it is absolutely time and labor lost to try and propagate new types or new varieties from them. Bud selection of such a character is futile. Yet this is the kind of bud selection that is generally practiced in the production of the so-called "pedigree" nursery stock offered to the trade. Variations due to environment are also worthless for "pedigree" purposes. We must not mistake nurture for nature. A Baldwin apple grown in the mountain regions of Western Maryland might not be recognized as a Baldwin by half the men in this audience. But a bud taken from one of these Maryland Baldwins and grafted on a Maine Baldwin tree would bring forth the type of Baldwin that you all know.

Stable variations in the form of sports may occur; but the crucial point in our argument against "pedigree" nursery stock lies in the fact that as far as our common fruits are concerned, they seldom occur. Lucky indeed is the man who finds and recognizes a true bud sport. Allow me at this point to quote Hedrick of the New York Experiment Station. He says: "For several years the speaker has spent much time in studying the histories of varieties of fruits. In the 'Grapes of New York' he has had to do with about 1500 grapes; in the 'Plums of New York,' 2000 sorts of plums; in 'The Apples of New York,' with about 700 kinds of apples. When this knowledge of thousands of varieties of fruits is focused, one sees in fruits stability and not variation. The generations of varieties of fruits do not change."

The Rhode Island Greening of today is the Rhode Island Greening of our grandfathers. True it is that there may be strains of some of our commercial varieties. We recognize more than one strain of Baldwins, there are perhaps two slightly different strains of Rhode Island Greening, and there are prob-



ably two distinct strains of Keiffer pears. Yet when we take into consideration the countless thousands of buds of these varieties that have been taken for propagating purposes, we cannot help concluding that any heritable changes in the germ plasm of these fruits are *very, very* rare; so rare, indeed, as to render the term "pedigree" fruit a catch phrase founded upon unsound principles. The J. H. Hale peach may be a true germinal variation of the Elberta. Time alone will tell.

To conclude, I will again state my position in regard to the whole matter of "pedigree" fruits. I believe that as a general principle for commercial practice there is absolutely no virtue in the practice of picking out the best bearing trees in our orchards to propagate from. I believe that from either a commercial or a scientific point of view, there is nothing of intrinsic value to recommend the practice of cutting scions from bearing trees in order to propagate nursery stock.

Every fruit grower and every nurseryman ought to be constantly on the watch for variations in fruit that give promise of improvement over the parent variety; but he should be very careful not to confuse the influences of environment with the influences of heredity. And he should not forget that out of the many millions of buds produced by any variety of fruit, the bud whose variation has its origin in the germ plasm is a rarity.

"Pedigree" nursery stock is a catch commercial phrase and the claims of nurserymen offering such stock for sale should be given absolutely no credence by the fruit grower.

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## VALUE OF HOME ECONOMICS.

By PROF. FRANCES R. FREEMAN, Orono.

I think we may consider in the first place the things that we teach in home economics. Perhaps it is not quite clear to all of us. In one division we may say we have the applied subjects, that is, the cooking and sewing, household management, sanitation, and so on. In what we call cookery, we consider the nutritive value of foods, their composition and the methods under-

lying their preparation, and also in dietetics the selection of the proper food, dependent on the age of the person, the work in which they are engaged, etc. We also do some work in the care of infants and infant feeding.

Then in sewing we teach the practical work—the selection of materials, the proper colors to be combined in clothing, and their hygienic values. We study the household management, the division of income and the budgets proper for the various expenditures of the house; we do something with the servant problem, take up the serving of meals and the various processes of laundering, sweeping, dusting, and other household duties. And we also study the sanitation of the home as well as its structure, the planning of the house, its decoration, the buying of the proper furniture, wall paper, carpets and the like.

In the other division we might put the fundamental sciences,—the fundamental subjects to be taught in other departments with relation especially to our own work. We have chemistry, bacteriology, physiology, physics, sociology and economics which are perhaps the most important, and of course the girls take English and a foreign language, as well as a number of other subjects, as their time will permit.

We have broadened the scope of the work very decidedly since the beginning of home economics. In the first place, I think the people were interested primarily and fundamentally in the individual family, in the individual home. But the work of the National Association of Home Economics has been broadened. It is not only interested in the individual family, but it is interested in the larger families which we find in the various institutions. It is interested in the country and city community. It is interested in the state and in the nation, in the state laws that we have regarding food adulterations, for instance, sanitary laws, laws governing public health. And the scope of its activities has been widened. In the first place, the only work that was done, we might say, was in the college, or the university, a school of that type. Now it has gone out from these institutions to the entire community. I think that perhaps we are doing just as great a work, if not greater, in the great movement that has been started within the last five or six years in carrying this information to the entire community. Of course that work is being supervised by the various extension departments.

Now there comes a question as to why we are teaching home economics, why it is put into the school curriculum, and why women should know something about this work any more than they should have done a great many years ago. With the great industrial evolution and the great factory system being developed, the home became less and less a producer and more and more a consumer. The industries that were formerly carried on in the home are now being removed and have been removed constantly. We do not have the spinning and weaving. We do not know anything now about the materials that we buy unless we have the training and the knowledge to judge those things,—unless we know the conditions under which they are made, while formerly the woman absolutely controlled all those things. She knew that she had cotton or wool. She knew under what conditions it was made, for that work was carried on largely in the home or in small communities which worked together.

Then we have had, with the great change in the industries of the home, a great change in the economic position of woman. Woman has gone more and more from the home into factory conditions, into factory work. These things have changed the social conditions of our homes. The family is no longer, perhaps, so much a unit in a certain sense as it was at one time. Our interests are varied. The woman is interested in one thing, the man in another, and the child in another, and each one seems to be pursuing his own special interests. So that with this removal of industries, with the removal of the women especially in the factory districts from the home and with the great changes that have come in the social activities of the family, the child, it seems, does not have the opportunity to learn how to cook and how to sew, and to learn the fundamental things that a girl should know. She does not have the opportunity to learn those things in her home and so naturally it has fallen into the school curriculum. And of course our ideas of education have changed very decidedly in order to make it possible for us to teach this work and put it on the same basis as the other courses of study that are given. So with those things in mind as to why we put it in the schools, we may consider why each woman, each girl, should know these things. Regardless of all the extreme things that we hear, and the extreme experiments that

have been made in co-operative housekeeping, etc., the home or the family still remains the social unit and undoubtedly it always will, and we judge that home by the social product which it puts out, by the individuals which come from the home, and of course the most important one for us to consider is the child.

The people as a whole, the community at large, has agreed, I think, that a home should maintain its members in such a condition of health and happiness, and morality also, that they will be able to do the most effective work possible for the greatest number of years. Now the fundamental things, of course, in order that a person may be the very best member of society and do the best work, are food, clothing and shelter. We go right back to the primal needs of the human race. It was, and it is still believed, I think, by a great many people, that a woman does not need to have any definite training in order to know how to keep house, that she just knows it any way. We had that same notion as regards farming. But we have gotten over that quite largely and we are coming to the same conclusions about women, that housekeeping is not a haphazard affair, that people have to know. Now it is true that there are very good housekeepers and cooks who never had any home economics. But these people had their training in some form and they learned those things in some definite way which was the training for that age. But women must be trained to the conditions of keeping house, of cooking, and because a woman is much more a consumer now than a producer, she must know the fundamental principles of health, the selection of foods, the selection of clothing, and the necessary sanitary conditions. So she needs to be trained in selecting the clothing for her family. She needs to know the clothing that is most healthful and hygienic. She needs to know whether the material is adulterated or not; whether she is getting what she pays for, and she certainly ought to know the factory conditions under which it is made. She ought to know the sanitary conditions of that factory, and she ought to know the number of hours that those people who are employed there are working. She ought to be interested very decidedly in the labor conditions of the women and the children who are producing these things.

When it comes to food she ought to know food values. She ought to know the best way to cook those foods and the best



ways to combine them. She ought to know the amount of food that a child in school needs and she ought to know the proper food to feed that child as well as the older members of her family, or the infant in the family. And the same thing is true here of knowing the conditions under which the food which she buys on the market is prepared and the conditions under which it is sold. She ought to know the value of money. She ought to know how much to pay. She ought to know that cheaper cuts of meat properly cooked are just as good as the more expensive cuts of meat, that they are just as nutritious. She ought to know how to prepare these cheaper types of food and save in that respect. She ought to know that not only does the house or the home show the character of the people who live in it, but she ought also to know that that home, that house, is going to modify very decidedly the characters of those people. We are influenced by our environment. We cannot control it entirely, no matter how hard we try. So she ought to know how to plan a house most conveniently, to be the most helpful, to be the most efficient. She ought to know the kinds of furniture to buy that are beautiful and artistic and useful. And she certainly ought to know the conditions that exist in the neighborhood that will affect the sanitary conditions of her home, and she ought to know how to keep it in a clean and healthful way. Those are just some of the very fundamental things that she ought to know.

And then we need more efficient home management. We need to know how to plan our house, how to keep house, how to cook and how to sew, with all the incidental things that go along with it. We need to know how to manage our homes. We have the farm experts now who are telling the men and giving instructions in farm management and the men are getting their farming upon a scientific basis. It is time the women got their housekeeping upon a scientific basis. Very, very few women keep any household expense accounts at all. They use no business methods. Now they need to keep accounts; they need to know definitely how much money they can afford to spend for clothing or for food,—how much they ought to spend, and then they should live within their means. And they need to plan their work and not go at it in any haphazard sort of way. We need the scientific business principles applied in our keeping of



budgets and the planning of our work, and we need to use the best machinery in our homes that we can get. You know it seems to be one of the characteristics of a woman that she will get along with any old thing in the house. The man does not do it. He buys the best farm machinery; that is, the most of them do. He buys the thing that is efficient, that he needs to do his work. Women work along with the same old things that are not efficient, that will not do the work and meet the demands made upon them, and say nothing about it. They should know the proper things that they need in their homes to carry on their work efficiently, and then they should have the initiative to get them. Women lack initiative in a great many respects,—it is so much easier to let things go on than it is to hurry around and get the things that down deep in their hearts they know they need. They just put it off until tomorrow. This is the case, I think, very, very often. The household is a profit concern in the same sense that a business is a profit concern; but the efficiency of the home is measured by the amount of comfort and satisfaction which it will bring to the members of that family, and by its social efficiency as to whether it turns out good members of society or not, and as to whether those people are capable of earning a living and doing their share in the industries of the world. A competent manager should understand all the principles of the business which she is running and a woman should know some sociology and economics. She should know the fundamental things which make for the most efficient person, mentally and morally.

Of course the physical, material things are fundamental, they are of primary interest in every household. But they are merely the basis for the expression of human nature, and I think it is time that the women get their work so planned that they have the information which will broaden their views of life and their outlook and whenever they do that, work and house-keeping are going to become less a drudgery. It is always true that when we know the whys and the wherefores of things, when we have the knowledge of the work we are doing, it becomes less a drudgery. It does not mean there is less work but it is less a drudgery. And the women, and especially the foreign women of the country, need to have the drudgery of their work lessened, so that they will have, as Miss Caroline

Hunt says, more time for just the mere joy of living. And Miss Arnold put it very emphatically at the national meeting of home economics this year when she said: "We talk about efficiency all the time. We need efficiency, but it is time that we talked less of efficiency and more of the real thing, human life." And that is certainly true, but we are only going to get that through the learning of these fundamental, physical things. I think Emerson sums up the whole thing when he says that "A house should bear witness in all its economy that human culture is the end to which it is built and garnished."

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## CONCLUSIONS FROM THE FIRST GREGORY CONTEST.

HON. A. K. GARDNER, State Horticulturist.

(Stenographic Copy.)

Most of you are more or less acquainted with the first contest in the Gregory prize, perhaps better known as the Carleton prize. You know in 1909, Maine, through the work of Mr. Hitchings and Mr. Yeaton, made an exceptional showing at the New England Fruit Show in apples and because of that showing and because of the business relations that he had had with the State of Maine, the late Mr. Gregory of Marblehead offered a \$1000 bond to the State of Maine. The interest on this bond every five years was to be given to the farmer producing the best orchard five years from setting. So that the first orchard was planted in 1910 and judged in 1914. This bond was a five per cent bond, so that the interest would be \$250. Only \$200 of this money was to be used as a prize, the remainder going to pay part of the expenses of the people who judged.

In addition to the \$200 premium offered by Mr. Gregory there were other premiums offered by various concerns doing business in the state and a premium by a friend, so that the total aggregated about \$800.

There were about 178 men scattered through the various counties of the state that entered this contest, and while some of them have dropped out, there are over 100 that have com-

pleted the five years' work. The others of course have completed the work, but we haven't any record of their orchard management.

There are some points of interest in regard to the work that they have carried on. There were—as near as can be estimated—about 7000 trees entered in the contest. Some of the orchards were more than an acre, and some of the orchards didn't quite come up to an acre, so perhaps 7000 trees is as near an estimate of the total number as you can get.

Now, of this number, using 7000 as a basis, about 15 per cent died in the first four years. That is a large quantity, unnecessarily large. Of this 15 per cent, 5 per cent only, and that is stretching it to the limit, died from what we might call unfavorable conditions,—winter killing largely or failure to start. Ten per cent died from what is simply lack of care or lack of foresight. Quantities of the trees died from mice, because people did not protect their trees with tarred paper or wire, or something of that sort.

The members of the department went to these trees from time to time, and offered the owners what advice they could. In most cases, of course, it was not accepted, and perhaps it is just as well for the orchards that it was not. But the main thing that we have to consider in the first contest, so far, is that the people do not take the care in it that they should. The trees as we found them in some of the better orchards were almost perfect. You could not ask for better trees. Some of the trees in one orchard calipered over four inches, and you can think of some of those Wolf River apples down there and you will get some idea as to how big the butts of those trees were. Many trees in the contest did not caliper more than  $1\frac{1}{2}$  inches, under practically as favorable conditions.

The soil conditions as we found them in the various localities were much the same. The trees were practically all planted on a rather light loam; and the slope conditions and other things were a good deal the same in each case.

The judging of the orchards was begun in August this year and continued for eleven days. Last year Mr. Sweetser and myself scored a number of the orchards from a score card that we had made up. We wanted to eliminate as many as possible of those orchards that did not have a chance, and we wrote to

the various growers, giving them the score and asking that we be freed from coming to their orchard at this time, mainly on account of expense. So when the time came for scoring we succeeded in getting down to about sixty orchards, the fifty scoring highest last year and about ten additional that we were unable to visit.

The score card that we used, I think, should require some explanation. The first thing that we considered in going to the orchard was the general appearance of the trees. And we considered that the general appearance should be perhaps the governing factor, as against pruning and some other items. Of the general appearance, the first thing we considered was color. Of course we figured that the culture methods that had been carried on would be demonstrated pretty fully at least for one season in the color, so that it was of sufficient importance to give a credit of 75 points on the basis of 1000. In judging color we took what we believed to be, as near as we could tell, the best color for the variety and judged accordingly. Color was given 50 points and size 25—color and size together 75 points. In the size, we thought that size for variety should be considered; also the fact that if trees were set as two-year-olds they should be given a little higher standard than trees set as whips. That was figured on as near a mathematical basis as we could get. The first thing in size was uniformity, taking the largest number of trees that were practically the same size as a basis, and scoring the others in proportion. The caliper was scored by taking the actual caliper of each tree about a foot from the ground. It seemed that was as near the ground as we could get a uniform caliper for various conditions in various trees. That was figured out mathematically. The diameter and height of the head were figured in the same way, and in each case, after we had scored a variety, we figured as nearly as we could what a standard should be. We did not place the standard as the largest tree, but as a tree that every man with good care could reach. For instance, I spoke of a tree that calipered over four inches. The standard for that variety, which happened to be a Stark, was three inches, within the possibilities of practically all the trees, provided they were given good care.



Another point that was considered in the general appearance was space. We believed it was of the utmost importance that trees be given enough room in the orchard. That is, a Baldwin tree should be scored off if it was set 25 feet each way, and a Spy tree should be figured in much the same way, and we established a standard, covering the different varieties. Ben Davis and Wealthies and varieties of that type, of course, could be much nearer together. That was given a basis of 75 points. Then we figured a little bit on alignment, not very much, 25 points on a 1000 basis.

After the general appearance, we put in the score card what we term condition, and under that we had freedom from mechanical injury, such as scars from lack of care in pruning, or running over it with a harrow or plow or some instrument used in the orchard work; freedom from insect injury, which of course included all insect injury; freedom from disease injury; and maturity of the wood. We believed we were justified in putting in a score for maturity of the wood, inasmuch as winter-killing depends almost entirely upon it. That was judged purely by the appearance of the foliage, by the condition of the outer twigs, and by the cultural methods that were being carried on; that is, whether or not there was anything being done to check the growth of the tree.

Under pruning we had some difficulty. It seemed quite a job to get pruning in and give it the right balance to the rest of the score card. We finally adjusted it by giving correct cutting a score of 150 points and in scoring correct cutting we considered training the tree and pruning the tree. It is pretty hard to tell where pruning begins and where training leaves off. But we did not feel that a tree that was not trained properly so as to have a strong framework for holding up the fruit should be given full credit, even providing it had been thinned out pretty well.

Then the last item was cost and, inasmuch as our figures were of not very much value—at least as there had been years when it had been almost impossible to get any—we considered the best thing to do was to give it a very small count and perhaps give every man perfect. This report will come in bulletin form very shortly for the benefit of the men that are going into the contest the next time, and we have included in the



report some things that may be of value to the man that is starting an orchard, including the distance apart of trees of various varieties, and how many trees it requires per acre set at various distances.

After we completed scoring we found that the prizes had been awarded practically as they are on the chart. Mr. Hobbs, first, with an orchard in Knox county; Mr. Dolloff, second, in Cumberland county; Mr. Morse, third, in Oxford county; Mrs. Bragger, fourth, in Penobscot county; Mr. Hescok, fifth, in Piscataquis county; Mr. Bearce, sixth, in Oxford county, and Mr. Morrell, seventh, in Waldo county. You will see that the orchards winning the prizes were pretty well distributed. Oxford county was the only one where two orchards were located. There should have been eight prizes awarded, but one of the concerns had some special requirements and they were not lived up to well enough, so that the prizes could be awarded. It is hoped that that prize can be carried over to the next contest.

I have tried to get as near as I could the costs that were entailed in producing the orchards that won prizes and, while the figures are not perfect, while they are not complete, they do show some things that may be of interest and may help the person that is starting next time in estimating about what it is going to cost to carry on the orchard.

In the first place, most of these orchards were carried on with a system of cropping. The first, second, fourth and fifth were carried on practically the entire time with some crop. The third orchard was carried on practically with a mulch, after the first year, I think. The last orchard was carried on by strict cultivation, just plowing alongside the trees and keeping a narrow strip cultivated, increasing that strip each year. Most of these orchards were sprayed four years, some of them were only sprayed three years, and all but one, I think, were sprayed four years. The owners used various materials, most of them, arsenate of lead, and many of them, lime sulphur; of course, for the aphid there were various materials,—practically all the materials that we use for that purpose. The Bragger orchard was set as whips and the others were all two-year-old trees.

*Tables Showing Yearly Expense Items.*

1910.

NAME.	Cost of trees.	Cost of setting.	Fertilizer.	Care.	Total cost.	Season's Crop, Net.
Hobbs.....	\$ .50 13.50	\$3.38	-	\$2.02	\$18.90	\$27.675
Dolloff.....	.30 13.20	2.20	-	1.32	16.72	52.80
Morse.....	.35 14.00	-	-	-	-	-
Bragger.....	.08 3.20	2.80	\$1.00	2.80	9.80	13.00
Hescock.....	.39 18.17	2.50	-	1.50	22.17	-
Bearce.....	.36 15.84	3.20	-	2.40	21.44	61.40
Morrill.....	.28 8.40	1.20	.52½	.75	10.80	12.75

Now on the first sheet, the first item is the cost of the trees. Looking down through the column it looks as if the trees cost very much the same all the way through, but that must be considered not as an acre but as a certain number of trees. For instance, in the first orchard, there were 27 trees on the acre, each tree costing fifty cents. In the second, 44 to the acre, or 30 cents. In the Bragger orchard the whips cost only eight cents each. As near as we could estimate, these trees (Hescock) cost 39 cents with 48 trees to the acre; and they cost 36 cents in this orchard (Bearce) and 28 cents in the other (Morrill).

The cost of setting varied quite considerably. In fact, I can't understand why it should vary as much. For instance, 27 trees in one orchard cost \$3.38 to set, while in another 30 trees cost \$1.20. There were three orchards with practically the same number of trees varying a good deal in the cost of setting. The others did not vary as much. The cost of fertilizing in some cases was kept separate from the crops, but in most cases it was carried on with the crop and nothing was charged against the orchard, so that we do not have a complete record of the fertilizing cost. The cost of care included what pruning was done and any of the work carried on in the orchard that year.

The total cost of the trees for the first year varies of course largely in proportion to the cost of the trees themselves. The "season's crop net" as it has been given to us,—was the cost of producing the crop and the fertilizer that was applied, and the nets that they received from the crops. You notice that that varies quite considerably. These orchards I think that year were all under cultivation with a crop.

## 1911.

NAME.	Fertilizer.	Cultivation.	Pruning.	Care.	Spraying.	Mulch.	Other costs.	Total.	Season's crop, Net.
Hobbs.....	\$1.35	-	-	\$2.70	-	-	-	\$4.05	\$47.25
Dolloff.....	-	-	-	1.32	\$ .88	-	-	2.20	81.57
Morse.....	-	-	-	-	-	-	-	-	-
Bragger.....	.30	\$1.00	\$ .10	-	2.50	-	\$ .10	4.00	13.00
Hescock.....	1.13	1.00	-	-	.50	-	-	2.63	.62
Bearce.....	-	-	.20	-	-	-	-	.20	90.00
Morrill.....	.53	.45	.15	-	-	\$ .15	.07	1.35	1.50

This sheet shows the second year of the contest and we have fewer figures for this year than we have for any of the others. In no case are all the costs brought down and they have been estimated as near as the grower could estimate them. The cost of fertilizer varied somewhat as did the other costs on the sheet. Here we begin with the spraying cost. You see three of the orchards were sprayed the second year of the contest. One orchard, the last, was mulched—cultivated first during the season and a light mulch applied late in the fall as a protection in the winter. The costs that year per acre did not vary materially, but here again the costs, if you figure them for individual trees, varied quite a good deal. You see the cost of this first acre was \$4.05, this acre down here only twenty cents. The variation of the crop nets is of course very noticeable and depended quite a good deal on the crop. I do not know what that 62 cents net was. I think probably it was grain. That sheet is not of very much importance.

## 1912.

NAME.	Fertilizer.	Cultivation.	Pruning.	Spraying.	Grafting.	Mulch.	Other costs.	Total.	Season's crop, Net.
Hobbs.....	\$1.35	\$1.02	\$ .34	\$ .67	-	-	-	\$3.38	\$20.25
Dolloff.....	-	-	.44	3.08	-	-	-	3.52	107.36
Morse.....	2.70	1.50	-	-	-	-	\$1.50	5.70	-
Bragger.....	1.00	-	.15	2.50	\$1.25	\$3.75	.15	8.80	5.00
Hescock.....	-	-	-	1.50	-	-	.50	2.00	5.55
Bearce.....	-	-	.44	1.32	-	-	-	1.76	33.00
Morrill.....	.60	1.50	.30	-	-	.60	-	3.00	2.10

The third year we began with larger pruning costs—perhaps not larger pruning costs but more people began to prune their trees, and the cost does not vary as much. The cost in three orchards, for instance, is a cent per tree, in another it is half a cent, and in still another it is a little more than a cent per tree. That is figuring probably about three minutes for a tree for pruning. Cultivation was charged in two cases; one orchard was grafted that year—that is, the whip orchard—and that was the beginning, I believe, of the mulch system on this particular orchard. The mulch cost, for 31 trees, \$3.75, a little better than ten cents per tree. The totals that year varied considerably.

## 1913.

NAME.	Fertilizer.	Pruning.	Spraying.	Cultivation.	Mulch.	Other costs.	Production.	Total.	Season's crop, Net.
Hobbs.....	\$2.02	\$ .84	\$1.35	\$2.70	-	-	-	\$6.91	\$55.35
Dolloff.....	-	.66	1.76	1.32	-	-	-	3.74	105.86
Morse.....	2.00	.25	1.60	3.75	-	\$2.40	-	10.00	-
Bragger.....	1.40	.60	2.25	.50	\$3.00	.75	-	8.50	8.00
Hescock.....	.53	.50	1.50	-	-	-	-	2.53	13.17
Bearce.....	-	.44	1.00	-	-	2.08	-	3.52	42.00
Morrill.....	.48	.24	.36	.12	.60	.60	1 pk.	2.40	2.10

This is the fourth season, sheet—1913. This year the pruning was charged in each case as well as spraying. Every orchard was sprayed last year. The cost for pruning increased a little, but not materially. One increased from a little over a cent to practically three cents, another to a cent and a half, and another one to two, and the others in something the same proportion. The spraying cost increased largely because of the work of the aphid in that year. The mulch system was continued in the Bragger orchard, and was reduced somewhat. The Dolloff orchard this year was in sweet corn. That is a pretty good record for the acre, outside of the trees, \$105.86 net. That is an exceptional year. The first orchard was cropped with various truck crops, as was the fifth and sixth. The first fruit, on these prize winners at least, was gathered last year, one peck of fruit from the Stark variety in the Morrill orchard. There were records of fruit from other varieties before that,—from the Wealthy and the Transparent and perhaps from other apples of that type.

## 1914.

NAME.	Fertilizer.	Pruning.	Spraying.	Cultivation	Mulch.	Other costs.	Production.	Total.	Season's crop, Net.
Hobbs.....	\$2.70	\$1.02	\$1.35	\$3.38	-	-	2 bu.	\$8.45	\$40.50
Dolloff.....	-	1.76	7.04	1.76	-	-	7½ bu.	10.56	77.44
Morse.....	4.00	1.60	2.20	1.00	-	\$2.00	1 pk.	10.80	-
Bragger.....	1.55	.31	3.72	-	\$ .93	1.55	3½ bu.	8.06	4.00
Hescock.....	8.25	1.00	2.50	-	-	1.00	½ bu.	12.75	40.00
Bearce.....	-	.44	1.00	2.40	-	-	-	3.84	14.50
Morrill.....	.90	.60	.45	.45	-	.15	3 bbl.	2.55	2.10

The last year of the contest is much the same as the year before, although many of the costs increase materially, especially pruning, the cost advancing quite a good deal. Pruning and spraying, cultivating and mulch, throughout the sheet, are very similar to the one before. That is the last year of the contest.



*Table Showing Comparative Nets and Costs of Single Trees.*

NAME.					
Hobbs.....	\$41.69	\$191.03	\$149.34	\$ .31	\$1.54
Dolloff.....	36.74	425.03	388.29	.17	.84
Bragger.....	39.16	43.00	3.84	.25	1.26
Hescock.....	42.08	59.34	17.26	.18	.88
Bearce.....	30.76	240.90	210.14	.14	.70
Morrill.....	20.18	20.55	.37	.13	.67

There are some totals that are of interest. In the first place the total cost runs very uniformly throughout, that is, the cost to the acre, with \$42.08 as the highest and \$20.18 as the lowest; but outside of that one orchard the cost run very close. The total nets, of course, as might be expected, vary considerably. The largest net for the five years of operation in this orchard was \$425.03,—that is about \$80 or a little better per year. In some orchards with the smaller nets, only hay has been taken off in the last three years. The cost per tree per year did vary, however. In the first orchard, the actual cost, as near as it could be found from the average cost for the five years, was 31 cents per tree and varied from that to 13 cents per tree, with perhaps 17 or 18 as a close estimate for the average. I think Prof. Sears, in his report on his own orchard of 108 trees per acre, gives the average cost per tree per year at something around 25 cents, and it is surprising that under conditions of the Gregory orchards this should come even as close. The total cost per tree for five years, as given in the last column, varied from \$1.54 to 67 cents. Even taking into consideration the different methods of orchard management, there should not be that variation. Probably the first orchard has been figured rather high. I have no doubt it has, because the figures have been lumped each year and they have been uniformly higher than in any of the other orchards, and I don't believe the man really has put in the time that would be indicated. Of course some of these figures are extreme estimates. I wrote one man in regard to the pruning of his orchard in 1911, and he wrote back that he thought perhaps \$1.50 a year would cover his pruning; \$1.50 a year would mean, he put in about eight hours

each year pruning his orchard of an acre in those small trees. Of course that was entirely out of reason. Nobody in the contest put in that much time. Most of them didn't put it in during the whole contest.

I would say that in our scoring, in addition to the seven prize winners, there were about twenty more orchards that scored over 900. Perhaps 150 scored less than 900 on a basis of 1000.

Now just a word in regard to the second contest. The application blanks for this contest are available now. We have some here and any man may obtain one by writing to the Department. They are just simply application blanks to be filled out and sent to the Department, stating that a grower wishes to enter the contest. It is the plan now to send out at the beginning of each year the cost sheet, to be filled in as the season advances, by the grower himself—probably two sheets, one for the actual cost of the work done on the trees, and the other for his cost in his cropping system, so that the cropping system may be kept entirely separate from the trees themselves. You understand that this contest has a two-fold advantage. It has the advantage to the grower of competing for a prize or a series of prizes; and it has the advantage to the Department, and of course to the other growers who are not contestants, of finding out the net cost of producing an orchard for five years under different conditions and with different varieties handled by different men. Those figures can be made of much value to the people of the state and perhaps to growers outside the state. In order to do that we must have accurate cost, and it is our plan this time to perhaps apply enough red tape to get as near as we can some good figures. We realize the trouble with these figures is that they are not accurate, and what we want to find out is the exact cost entailed, and we have drawn up some regulations to be filled by the people who wish to enter next time. These regulations are in the rough at present. We plan to have a report sheet sent out to each grower at the beginning of each season. We took the liberty to put in a score card, inasmuch as most of the growers this time did not know what the items to be considered were, so that they did not know where to put in most of their time any more than to carry their trees as well as they could. We have put in a score card very similar to the

one we used, which proved very satisfactory, except in this case we have increased the cost to a basis of 75 points so that it will have quite a good deal of weight in deciding which orchard is the best.

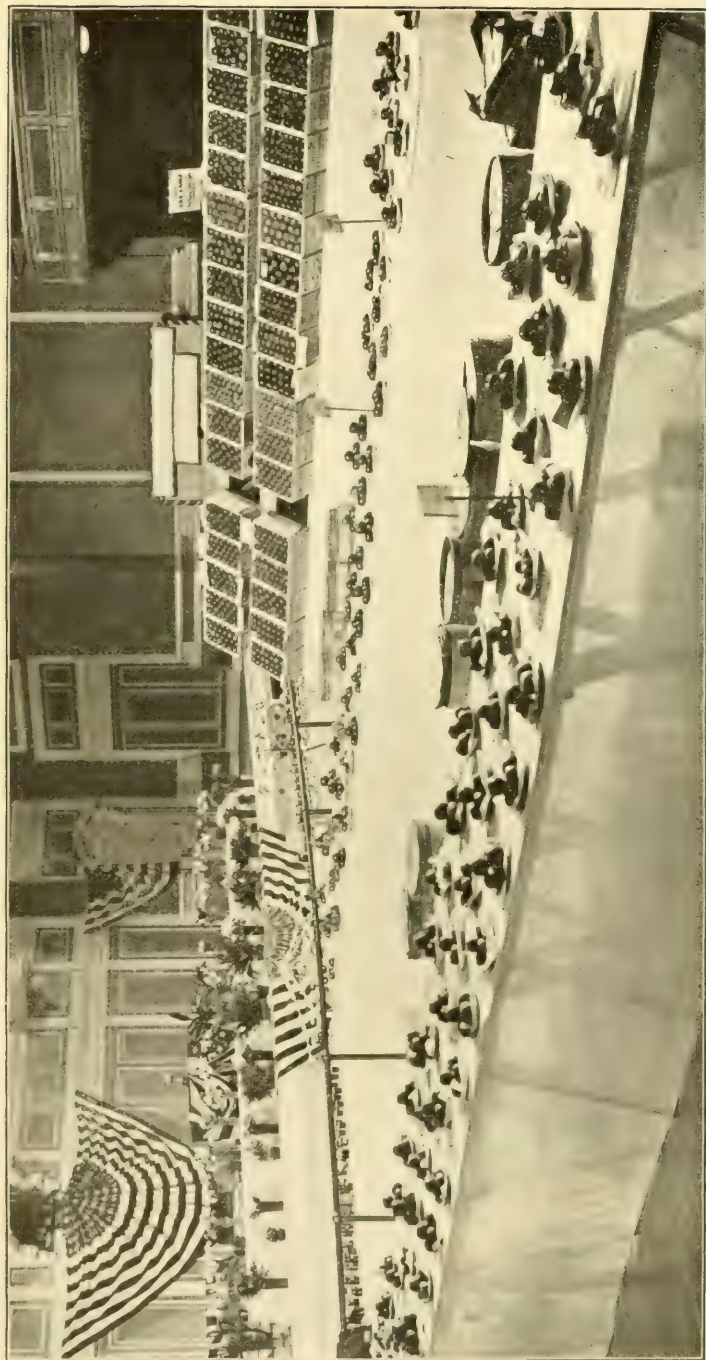
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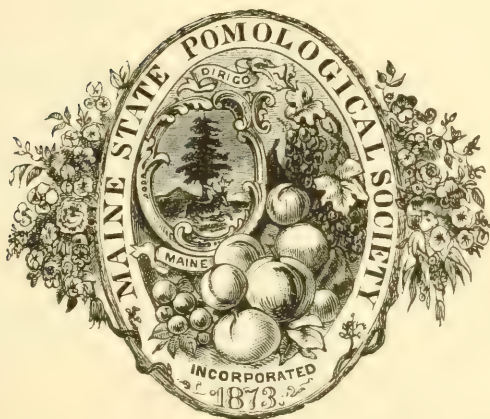
Looking across the upper end of City Hall, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

# TRANSACTIONS

OF THE

## Maine State Pomological Society

FOR THE YEAR 1915



ANNUAL EXHIBITION HELD IN PORTLAND  
NOVEMBER 2, 3, 4, 1915

## OFFICERS FOR 1915.

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LYMAN K. LEE,	Foxcroft

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E. L. WHITE,	Bowdoinham
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E. F. HITCHINGS,	Orono
H. L. KEYSER,	Greene

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HOWARD L. KEYSER,	Greene
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W. H. CONANT,	Buckfield
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Washington County—DAVID CAMPBELL,	Cherryfield
York County—C. E. FELCH,	Limerick

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Kelly Brothers	Dansville, N. Y.	Wyman, F. L.		West Paris



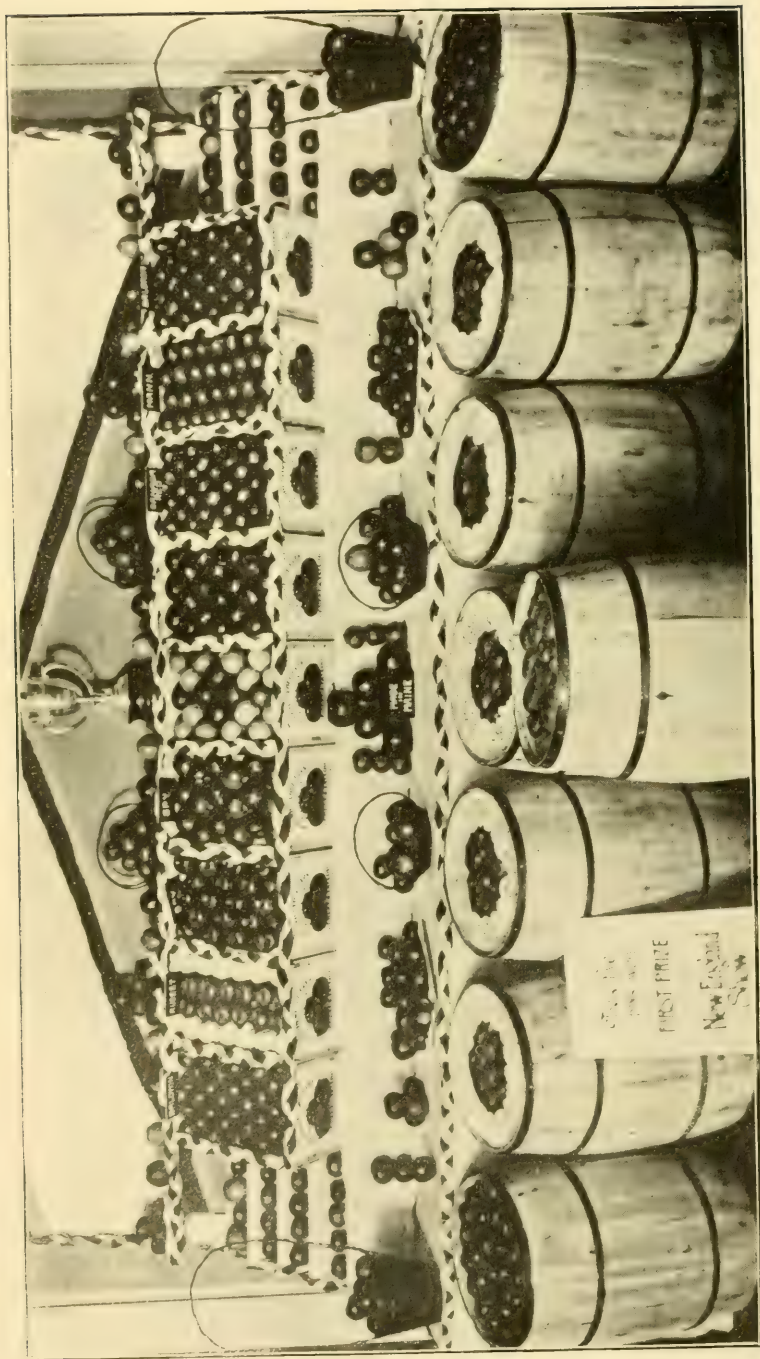


Exhibit from orchards of Clement & Taylor, Winthrop, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.



ANNUAL MEETING  
OF  
MAINE STATE POMOLOGICAL SOCIETY

PORTLAND, NOV. 2, 3, 4, 1915.

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TUESDAY EVENING, NOVEMBER 2.

Prayer.

ADDRESS OF WELCOME.

HON. WILLIAM M. INGRAHAM, Mayor of Portland.

*Mr. Chairman, Ladies and Gentlemen:*

It is certainly a great pleasure that I have this evening in welcoming to our fair city the Maine State Pomological Society. It is certainly an organization that deserves the praise and the good will of all the citizens of Maine. We, in fact, thank the society for coming to Portland and placing in our hall such a beautiful exhibit of one of the great industries of Maine, that of apple raising.

Agriculture is certainly one of the main things in this world. It is probably the most important calling, because nearly everything depends on the success of agriculture, upon the success of the farming interests in tilling the soil and bringing the products to us all. And so the State of Maine always has taken a great interest in agriculture and has done all it possibly can to increase and forward any kind of a movement that has had agriculture as its foundation. And today we are here to welcome a society that has for its main object the promotion of the apple industry. Years ago apple growing was a mere incident of farming. The farmer had a few trees on his farm; he gave little attention to them. If anything grew on those trees he gathered it, whatever it might be, fruit of any kind. But that is all changed and the farmer today realizes that the apple is one of his chief products. It is no longer an incident of farming. He makes it a specialty and he has learned that it is

one of the very best lines of farming. It is something that demands his attention, and something that in return brings him a good livelihood.

The apple industry has grown to such proportions that it is probably recognized today as one of the chief branches of farming. Throughout our state, wherever we go, we see the great orchards, especially in that section of Maine which is commonly known as the apple belt, running from Turner right up through to Waterville. That great section of Maine is rich in soil and the climate is just right for the production of apples. And so the Maine farmer, particularly in that section, is giving his time and attention to this most important branch of agriculture. It is certainly a most promising thing to see such a change in the State of Maine, because it means so much to our industrial prosperity that this particular branch of agriculture should receive encouragement, and I am sure we are all glad to do everything we can to lend our assistance in promoting the interests of the Maine State Pomological Society.

The apple is one of the most important things for the table. It enters in different forms into a great variety of food. It is prescribed by the physician. I have no doubt that people in considering the advantages of apple raising have thought of these different things, and that it has been a means of stimulating the interest in that particular line of industry. I am sure that it is a very attractive branch of farming. It is something that I, personally, have had a little experience in. I am the possessor of quite an orchard, so I know whereof I speak. I have a real interest in the success of the Maine Pomological Society from personal contact with the work. I know how important it is and I know what it means to this great state. I am very glad indeed to see that the farmer is taking an interest in this line of work, along the proper scientific lines, and it is important that he should do so. The apple industry demands as much thought and attention and skill as that of any other branch of farming. Years ago the farmer, as I have said, paid little attention to his apple crop. Today he gives it his attention by careful pruning, spraying, and cultivation of the land, and he is getting the results, and we find today that the Maine apple is the best in the world. It has no superior, no competitor. If the Maine farmer will only give his attention to the careful

and scientific cultivation of the apple, there isn't any doubt in my mind but that he can command the markets of the world. The Maine apple has the flavor; that is the principal thing. It is the apple which people like. The Oregon apple, beautiful to look at—large, fine color, over-cultivated, perhaps, if anything—has not the flavor, and it never can have the flavor of the Maine apple. And in Maine we can, as proven by the exhibits here tonight, produce apples of equal size and beauty, as compared with the Oregon apple or any other, and we have the flavor thrown in, which is the main thing, and you will see that we will command the markets of the world easily when that is known. The Maine apple is reaching a wider and greater market all the time.

The Maine farmer should give very careful attention to the packing of apples. This is one of the most important things. And if he will only do this, put up his apples in a careful and scientific manner, place them on the market in an attractive form, I venture to say there will be no trouble in selling the Maine apple in any market. But the old method of putting a few apples of attractive appearance on top, and a few on the bottom in case the barrel is opened at that end, and filling up with mean ones, has gone by, and any man who would do that ought, at least, to be called to account for such actions. But I think that this old trick has been exploded and it is not practiced any more, and I am glad to know that we have laws in Maine to compel men to pack apples in an honest and scientific way, because that is the proper way to gain the confidence and the patronage of the apple buyer.

I am particularly glad to have this opportunity of greeting the officers of the organization and of congratulating them in carrying on this good line of work. It is something that helps us in the city as much as it helps those in the farming communities who are raising apples for profit. We want their products in the city. We are interested in what they have to sell; because, after all, it is in the city where the product of the farm finds its market. I am sure we all take an interest in the Maine State Pomological Society, and we welcome you to Portland, and we hope that your society will favor us again very soon, in fact we would be glad to see you every year here in Portland. I thank you.

## ADDRESS OF WELCOME.

GEORGE L. CROSMAN,

President Chamber of Commerce, Portland.

*Ladies and Gentlemen:*

I feel that it is a great privilege and honor to be able to second this welcome that has been given you by our Mayor. I cannot add much to what he has already said, but in a few words I would like to give you a very hearty welcome on behalf of the Chamber of Commerce of the city. Portland we call America's sunrise gateway. We call Portland the gateway of Maine, and to Portland we welcome you most heartily. Portland is alive. Portland has recently been put on the map in larger letters than it ever was before. We hear that people are talking about Portland from one end of the country to the other. We propose to keep them talking, and we propose to keep them guessing, to some extent, as to what we are doing down here.

Portland does not mean for any real good thing to go by it. Of the one hundred thousand people in Portland, the Chamber of Commerce is made up of the most wide-awake, most progressive, and most lively bunch of them all. You will notice, please, that I said of the one hundred thousand people in Portland. We have various estimates. Our census says sixty thousand, but we people in Portland do not believe that. A good many of us believe we honestly have seventy thousand—sometimes we try to stretch it to seventy-five thousand. Tonight I have stretched it to one hundred thousand, but I am merely looking forward just a little, and when the Chamber of Commerce has gone on a little further in its activities the one hundred thousand will be here all right. So it is a case of not now but soon.

We know a good thing when we see it, and the Pomological Society we recognize as one of the best things in Maine. Therefore, we welcome you. And we are prepared to give a reason why we so regard you and why we welcome you. Yes, there is a reason. The Chamber of Commerce of Portland is—shall I say it?—the greatest and most intensely in earnest cooperating, municipal, civic body in Maine—cooperating, pulling together,



shoulder to shoulder, for the welfare not only of Portland but of the whole state. We believe in cooperation. The day of bickering, petty jealousies, enmity, of self-seeking, hostile rivalry, is fast becoming obsolete. Cooperation, unity of interest and effort, is now recognized as the true basis of prosperity and success. You are cooperating, working together heart and soul, for mutual interests and to build up one of the finest industries of the state. Your success means prosperity for the state. Therefore we welcome you and greet you as coworkers. The Chamber of Commerce welcomes you, because it welcomes all efforts and endeavors to lift standards of production, standards of marketing, standards of doing business, all efforts to put Maine and Maine products in the forefront of our national life and industries.

I want to refer to question 17, contained here in the program, "Should not we as fruit growers produce all the apples which are consumed in the State?" I say to that, absolutely,—yes, and more. We should not only produce all the apples that are needed in the state but we should produce enough more to send them right straight across to the Pacific coast and show the people, as the Mayor has intimated, in California and Oregon, what a real apple looks like. I have been in California, I have seen the apples of California. They are just like the apples of Oregon, according to the Mayor's reference. They are big, fine-looking things on the outside, but inside, why there is plenty of juice but very little flavor and quality from the standpoint of a Maine apple man. They raise great big things on the Pacific coast, and they talk big, and they make a little more noise than we do down here in Maine. I am inclined to think that we make a mistake in not making more noise. Why, bless you! there in California not long ago a farmer came to me and said something about his potato crop and boasted about what nice juicy potatoes they raised in California. Well, now, they do raise nice, juicy potatoes. They raise everything nice and juicy. They irrigate it to death.

Maine raises the finest quality of men, and, if I do say it, many, many states in this nation today are what they are by the enterprise and the brains and the brawn of the men that Maine has sent out to them. There is no reason, friends, why Maine



should not raise just as good apples as she raises men, because the men have the brains to produce the apples. And, therefore, we ought to have both men and apples of the very highest and best quality. I noticed in one of the papers the other day about some fruit-growing people out in Kansas sending the President a wedding present of a barrel of apples, and a suggestion was contained in the paper, that I want to second here most heartily, namely, that out of this magnificent exhibit downstairs, the very finest and the best of those apples down there in that hall—this is the suggestion of the paper, not mine, I am merely seconding it and saying go ahead—that the very best and the finest be selected and a barrel be made up and sent to the President as a wedding present from Maine, that he may see, as the papers say, what regular apples are like.

The Chamber of Commerce welcomes you because it stands for enterprise, push and up-to-date methods. You are studying your business. You are striving for perfection of product. Perfection means success. You are making intelligent application of scientific methods to secure best results. That appeals to us, to the Chamber of Commerce. Nothing worth while is ever realized through indifferent, haphazard, lazy, moss-back, old foggy methods. We hear much about developing Maine. You are helping to develop Maine by the surest and most practical method that can be devised. Developing Maine is not a hot air process. It is not a hot air job. It is downright, conscientious hard work, developing her resources and earnestly and intelligently using her natural endowments. It is a process of getting by painstaking labor the most and the best products from every available acre of her farm land, from her industrial workshops. The apple surely is a glory to the State of Maine. Go downstairs and see what there is there—great, big, luscious, red-cheeked, crimson, green and golden apples—firm flesh, economic in food value, health giving, hearty and appetizing. Do what you will with your oranges and lemons, your pine-apples and your prunes, give me a Maine apple for the all-round satisfaction of a staple fruit. We welcome you because you are cultivating the finest fruit God ever gave to man. We want you to come again.

## RESPONSE.

H. L. KEYSER, Greene.

*Mr. Mayor, President of the Chamber of Commerce, Ladies and Gentlemen:*

On behalf of the Maine Pomological Society I want to thank the Mayor for his cordial words of welcome, and through him and the President of the Chamber of Commerce, to thank them for what they have done and what they are doing.

Three years ago I had the pleasure, as presiding officer of this society, in this building, to advocate two measures to be brought before our coming meeting of the legislature in the following January. One was a greater recognition of this society by the state and the other was a law for the better grading and packing of fruit. At the hearings before the Agricultural Committee at Augusta the committee very easily were convinced that we should have at once a larger increase in our stipend and consequently a better recognition by the state. When it came to a consideration of the other measure, we were opposed, largely from want of proper information and understanding as to what we were advocating, a better grading and packing of fruit, and I refer to this particularly here tonight because at times the clouds were very dark and the outlook was gloomy; but when it came to the day of the second hearing before that committee there was one great sunbeam came before those who were fighting for this measure before the legislature. And that ray was the presence of a large delegation from the Portland Chamber of Commerce. They were not only there to say a good word for us, but I want to say to them tonight that if they had not even said a word before that committee, their very presence at that time was of the greatest help to us and of great assistance in receiving the unanimous report that we did, recommending the passage of that measure before the legislature from the committee. And it was not necessary tonight for the Mayor to extend to us the keys of the city of Portland, because we have been here before, Mr. Mayor, we have enjoyed ourselves, and we have come back. We have been royally entertained here in the past, and we recognize in the grasp of the hand of fellowship, in the smiles which we received, that

we are welcome. It requires no extension of the keys of the city. We know that we are among our friends.

The Maine Pomological Society's slogan for many years has been better fruit for Maine. But we have added many more words to that slogan of late years. I mentioned one only a few moments ago, which is the better grading and packing of fruit. And we are just as deeply interested today in the market question, in the distribution question. I want to say to you that it is no easy task to raise such fruit as you see in the hall below. It requires a very peculiar make-up of man. He must have some knowledge of soil conditions. He must have some knowledge of plant pathology, some knowledge of insect life, and, incidentally, insect death. As it has been said, and well said this evening, there is no man in the world who works in closer partnership with the Almighty than the orchardist. He is next to nature.

I am not here tonight, in this response, to recommend on the part of this Society any radical legislation, but there is one thing that I do want to refer to for just a moment, not that the time is ripe for it, because we are not ready and as I told a gentleman tonight, I want to live in the state a few years longer, I don't want to be driven out yet—it has been mentioned in the past and I mention it, that it may become a question of education—and that is, the enforcement of spraying. It sounds radical. But it is being talked of in other states. And sooner or later the State of Maine must cut down its old disease-infected trees, and Mr. Brown and Mr. Jones who take care of their orchards and spray faithfully and put on the greatest insurance that it is possible to put on, must have that protection from their neighbor who does nothing. The Mayor will tell you, if you build a residence in the city of Portland today that you must put down the sidewalks according to ordinance, that you must make your sewer connection according to law. And there is no reason why the orchardist of the State of Maine should not have protection against his neighbor whom the President of the Chamber of Commerce refers to as the mossback man who won't advance. I do not advocate it tonight as a radical change. I mention it, because all changes of this kind must be talked about, and it takes a long while. It is an educational matter. After a year like this, in which all the elements seemed to be against us, and we have carried out faithfully our

whole program and possibly failed, many of us, in the quality of fruit in the last instance, I want to say: Keep up your courage, keep up the fight, do not give up. Just remember those four lines of Kipling—

“Orchards where I’d ruther be—  
Needn’t fence it in for me!—  
Jes’ the whole sky overhead,  
And the whole airth underneath.”

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## APPLE GROWING IN VIRGINIA.

S. W. FLETCHER, Fisherville, Va.

( Illustrated Lecture. )

*Mr. President, Ladies and Gentlemen of the Society:*

I am glad that I do not come here tonight as an utter stranger to New England. I was born in Middlesex county, Massachusetts, and if I am to believe the fragrant memories that come to me now of my boyhood days I was raised mostly on pumpkin pie, doughnuts and Baldwin apples. I have gone far afield since then, across the continent and back, and finally have come to rest in Virginia where I have a home that I love very dearly and an apple orchard that I prize very highly; but as I came through these familiar hills today, the first time in eight years, I realized that however dear is the state of my adoption, it can never be quite as much to me as New England; and however much I may value my Virginia York Imperials and Winesaps, there can be no apple that will taste quite so sweet to me as the New England Baldwin.

I have come not to lecture or to advise, but simply to tell how we are growing apples in Virginia, and perhaps to draw a few lessons which may be applicable here. A good business man learns from his competitors. We in Virginia are your competitors in the apple markets of the world. Over one-half of our apples are exported and come in competition with your Baldwins; and we meet in the markets of Boston and New York.

*Location.* Virginia apple growers share with you the advantage of a location near the great centers of population. We are equally advantageously located as regards local markets, facili-



ties for the export trade, and cost of transportation. It costs fifty cents to ship a bushel of apples from Oregon or Washington across the country. The opening of the Panama Canal has not, as yet, proved a benefit to our western competitors. It costs me eleven cents to ship a bushel of apples from the Shenandoah Valley of Virginia to New York, and I presume your rates are even less. This difference in freight rates is a nice little profit in itself.

This picture of my farm I use to illustrate a fact that must have been impressed upon you as forcibly as it has upon us,—that we must put our orchards upon the hills and slopes if we are to secure maximum protection from frost. I have had my orchard seven years, and in that time have never lost any considerable part of a crop from frost. Out west they pay twenty-five dollars an acre or more to protect their orchards from frost by the use of smudge pots. How much more practicable it is, and how much it reduces the cost of production, if we have a location that secures frost protection without cost.

*Steep land.* You will notice that this is a gentle slope. It is not necessary to get steep land in order to secure freedom from frost. We have many orchards in Virginia, particularly on the eastern side of the Blue Ridge, that are on steep mountainland. It is so steep that those mules are having a hard time sticking on it. They are hauling down six barrels of apples on a sled and like as not the sled will get away from them and turn over. Apples were planted on these very steep sites in order to take advantage of the black mountain soil known as the Porter black loam—an excellent apple soil. But I contend that one is not justified in growing apples on such steep land, even to secure immunity from frost and favorable soil. It is almost impossible to do a thorough job of spraying on such land, and the cost of all the orchard operations is increased so that it greatly increases the cost of producing apples. Undoubtedly the time will come when our population will be so dense that we will be obliged to use these steep hillsides for apples, but not now. We can get good apple land, reasonably free from frost, on moderate slopes.

*Distance from shipping point.* This picture shows the hauling of apples to one of the depots in Virginia from orchards twenty miles away. The distance of the orchard from the shipping point is a vital matter. When apples were selling for six



and seven dollars a barrel net to the grower, as they did in years past, growers could afford to haul them twenty miles to the depot. Now the time has come where the man who makes money in apples must produce them at the lowest possible cost of production, like any other business man. He cannot afford to haul a load of ten or twelve barrels of apples twenty miles to the cars at a cost of forty cents a barrel, as some of our fruit growers have done. These people will be gradually forced out of the apple market. Personally I would not make an investment in an apple proposition which is over six miles from the shipping point and which does not have reasonably good roads to the depot.

This shows one of our typical apple soils, the Hagerstown stony loam. You can see the flinty limestone fragments on the surface. There is a red clay subsoil about twelve inches below the surface. I do not care so much what the surface soil is, if only there is a strong clay sub-soil. The more gravel or chirk in the surface soil the better; it acts as a mulch on top of the land, making it less subject to drought.

This picture taken on my farm five years ago shows a crop of corn that will hardly average five bushels to the acre. The next picture shows the same field as it is today, with a promising young orchard on it. These two pictures illustrate this point that land may be utterly worthless for general farm crops and still be excellent for fruit. My farm is on Barren Ridge; it was so named a hundred years ago by the Pennsylvania Dutch farmers who settled that country, because it would not produce good corn and grass, so they thought it was worthless. Now it is worth twice as much per acre as their rich farm land, because it will raise apples. Some time every soil, even those we now consider barren, will find its sphere of usefulness.

*Planting.* Here are one, two and three year old trees. I always have preferred a one year old tree provided I could get them at least four feet high and stout; then the head may be formed at the desired height. Moreover, they will come into bearing just as early as two year old trees.

*Cropping the young orchard.* My method of caring for the young trees possibly is somewhat different from yours. You have heard it advised that a sown crop should never be grown between young apple trees—always grow a cultivated crop, like potatoes or corn. That is right if it is feasible; but I have

found that the most practicable method for my conditions is to grow the standard farm rotation of corn, wheat and grass between the young trees. That does not mean, however, that those crops are grown close to the trees so that the trees receive no cultivation. A strip of uncropped land five feet wide is left each side of the row of trees, the year the trees are set out, and that is kept harrowed. The next year this strip is widened to six feet, the following to seven feet, and so on. Starting with corn when the trees are set, the rotation comes back to corn by the time the trees are ready to take full possession of the land, when they are five or six years old. For our conditions we find this method more practicable than growing potatoes or any other cultivated crop between the rows. Some of you may think this is heresy; no doubt it is for your conditions, but not for mine.

*Tillage or sod.* Fifty years ago almost all apple orchards were in sod. Then came the tillage propaganda, which was derived chiefly from California. We were told that all apple orchards should be cultivated, and some intimated that the man who did not cultivate his apple orchard was either a fool or a knave; no exceptions were made. This was a swing of the pendulum to the other extreme. We are coming now, I think, to see that there are conditions when tillage of mature bearing apple orchards may not be as desirable as some other method of soil management. I suppose that eighty per cent of Virginia orchards are cultivated, but there are a large number of exceptions. One of these is shown here—a profitable young orchard of York Imperial, on land so rocky that it would try the patience of Job to attempt to plow it. We have many profitable orchards on land of that type.

A second occasion when tillage is not practicable is shown here; the land is so steep that if it were plowed and cultivated it would wash to pieces in a few years. Our Southern hillsides erode very quickly. On thousands of acres of the most profitable apple orchards in Virginia the scythe is the only practicable implement of tillage. Perhaps red clover seed is scattered every two or three years and the aim is to get as much herbage to grow as possible. The grass, weeds and sprouts are cut at least twice a year and left on the ground as a mulch. On strong land this method produces excellent results.

A third exception is shown here—an orchard on very rich, moist land. That is one of our famous Albemarle Pippin orchards, lying in one of the coves on the eastern slope of the Blue Ridge. The soil is naturally sub-watered from springs on the Ridge above, and is rich, deep and moist. To plow and cultivate such an orchard would make it grow too luxuriantly and favor blight. These cove orchards on “pippin land” are some of the most profitable in Virginia and they are seldom tilled. So there are these exceptions in Virginia when tillage is not as practicable as some other method, and there may be some in Maine.

*Mulching and pasturing the orchard.* If the mature orchard is to be left in sod there are two ways of handling it—by mulching and by pasturing. In mulching, the grass and herbage is cut and left on the ground, which is fertilized so as to get as much of a growth of herbage as possible. A supplemental mulch of straw is sometimes brought in to make a still heavier mulch around the trees. We rarely use that in Virginia; straw costs too much. The more common method is shown here, which is in my York Imperial block, where the grass is simply cut with the mowing machine two or three times a year and is left to lie in the orchard.

If the land is not mowed it can be pastured. In many cases sheep are the most useful animals for this purpose, since they keep the weeds down and the herbage cut close. They do not let the ground get filthy with weeds, and they do not browse the limbs as high as cattle. Hogs are used to some extent, and are very useful for that purpose. Cattle are very hard on apple orchards, as you know. Sometimes calves and young cattle are allowed to run in orchards, as shown here, but you can see how high they browse the limbs. They are heavier than sheep and hogs and compact the soil, and altogether are not desirable in the orchard. We have many profitable sheep and hog pastured orchards in Virginia, especially on the stronger lands. I am not advocating that Maine apple growers should follow these methods. I am simply saying there are conditions in Virginia where they have proved successful.

*Orchard tillage.* If the orchard is to be tilled, plowing should be done early for several reasons. When plowing is delayed and there is freshly turned ground under the trees when they are in bloom, there is more danger of frost killing the blos-

soms. Again, by that time the annual feeding roots of the trees have begun to grow and there is more or less injury by plowing, especially if it is deep. If plowing is done when the trees are dormant there is no injury. We plow not later than March, if we can help it. I do not use a plow in the older orchards but a disc harrow. Disking so as to cut out not more than four or five inches deep gives us equal results as deep plowing with a two-horse plow.

After plowing or disking, we use the spring-tooth cultivator, which is our standard implement for summer tillage. What is good tillage in an apple orchard? We are advised by most people to harrow the apple orchard every week or ten days. I think we should emphasize more than we do the fact that on certain soils, which are naturally retentive of water, harrowing once in three weeks may be as effective in conserving moisture as harrowing every week on other types of soil. "Good tillage" may be once a month or once a week, according to conditions. It is a personal problem for each grower.

*Forming the head.* I suppose there never have been two fruit growers who have agreed on all points in the pruning of apple trees; so I shall merely tell you how I prune and why. This shows a tree after it has made its first season's growth in the orchard. The next picture shows this tree is pruned. I use the modified central shaft system; that is, the leader is preserved for two or three years. I usually leave three or four limbs the first year, including the leader. All are cut back heavily, the leader being left about a foot longer than the others. The second year another whorl of limbs comes out from the tip of this leader, making two sets of limbs on the trunk. Then I take the leader out and cut back the others. Thereafter the pruning consists simply of thinning out.

I prefer the modified central shaft, taking the leader out after the second year, because it gives eight or nine limbs to bear the weight of fruit instead of three or four. When all the fruit is borne on three or four limbs, as in the open center system, the strain all comes on a very small part of the trunk and splitting is likely to result. We must remember that our wood is more brittle than it is in the west where the open center method is practiced to advantage. They can develop their best fruit by cutting out the center, and the trees do not break, but subject our trees in Virginia to the same weight of fruit and they will



break. We have had too much copying of western methods, just because they were successful there, not only in the care of the trees, but also in the packing of the fruit. We must remember how different our conditions are, and develop a practice that fits our own conditions.

This shows an apple tree in the famous Vergon sod mulch orchard of Ohio. I want you to notice what an immense amount of bearing surface it presents. The unit of production in an apple orchard is the amount of bearing surface, not the number of trees. This one tree has as much bearing surface, or potential ability to produce apples, as half a dozen badly crowded trees. This tree is an argument for wide setting, which is forty feet apart with us. It is also an argument for the use of every device and art in pruning to keep the tree low. Some varieties, however, you cannot keep low, as they tend strongly to take an upright form.

*Pruning bearing trees.* This shows part of my bearing orchard in the winter, after being pruned; it shows how thin I try to keep the tops. There is a good old Methodist hymn it would be well to sing or to whistle while pruning:

"Clear the darkened windows,  
Open wide the doors,  
Let a little sunshine in."

Sunshine makes color in apples—not potash nor any other kind of fertilizer, but sunshine and the degree of maturity. The more sunshine around the apples, the redder they will be. As our grading laws become more stringent, color will count more in the selling value of apples.

Here is a tree top in which there is a constant struggle for life between the different limbs. You cannot expect good apples when the limbs are cramped by their neighbors. Neither can you expect a long lived tree when the wounds are unpainted and unhealed; the tree soon becomes rotten-hearted. This picture illustrates what follows when pruning is neglected for several years and then all the surplus limbs that have been accumulating are cut out at one time; you get a forest of water sprouts. Here are some safe rules: Cut back young trees heavily the first two years, to make them stocky and branch low, and cut out all but the scaffold limbs. After this let the pruning consist merely of thinning out. Never prune bearing trees heavily any



one year unless they are very weak. Prune lightly, every year, so as not to upset the bearing habit.

*Spraying machinery.* In spraying, our problems are very similar to yours. I prefer the gasoline spray outfit for ordinary work. The compressed air outfit is used on the steeper land. This is a picture of the old type, one tank being for air and the other for liquid, to be charged at a central loading station. This is open to the grave objection that you are obliged to make long trips back and forth to the loading point to charge the tank. The new type of compressed air outfit, in which the compressor and engine are mounted on the wagon with the spray tank, is much superior. It marks the greatest advance in spraying machinery in recent years; though I would not say that it is better than a good gasoline outfit.

There is one, and only one, real hurry up time in apple growing, when the job has to be done on the minute; that is the spraying when the blossoms fall. We must get our poison in the calyx cups within a week or even less or it will be too late. This means that the spraying radius of an outfit is limited. We used to spray forty or fifty acres with one power outfit; now we believe that twenty acres of full bearing trees is nearly the maximum for one power outfit. It will help a great deal if we can pipe water to all parts of the orchard. We can then distribute the concentrated lime-sulphur solution where water is available and not go out of the orchard to load. This picture shows water piped from a spring on the hillside above the orchard. By this method the spraying radius of a machine is practically doubled and the cost reduced.

*Insects and diseases.* In Virginia, as in Maine, I presume, the codling moth is the greatest apple pest, not even excepting the San Jose scale. It causes more loss in Virginia than all other pests together, in spite of all our efforts. I have come to the conclusion, after four years' trial, that I will not use the dry lead any longer, because it does not seem to have the sticking properties of the paste lead. It may be all right in Maine, where there is no large second brood of moth, but we have two strong broods, emerging at different periods, and must have a poison that will stick all summer on the leaves and fruit, and the paste does this better than the powder.

If we wish to have fruit next year we must make fruit buds this year—big, fat ones. We can see them in the axils of the

leaves in August, if there are healthy leaves around the bud. Protection of the foliage from disease is fully as important as protection of the fruit. In Virginia many neglected apple trees are defoliated by the cedar rust. Part of the life of this disease is passed on the red cedar and part on the apple, where it disfigures both leaves and fruit. Spraying helps if done at exactly the right time, but the most effective method is to cut down all the cedars within half a mile of the orchard. Stringent measures have been taken in the apple sections of Virginia to cut down all the red cedars in the neighborhood. At Winchester, Virginia, the banks refused to loan money to any man who had red cedars on his place which were a menace to neighboring orchards. They justified themselves in this way: "Apple growing is the chief industry of this county. We get our money from the men who grow apples. If we are going to stand in the way of their making money from apples, we do not care to accommodate you." We now have a state law under which any apple grower whose neighbor has red cedar trees that are injuring his orchard he can get them cut down by protesting to the proper authorities. It has been declared constitutional, and is working to the interest of the apple industry.

Some of you may have nursery stock come with the woolly aphid and crown gall upon the roots. These have proved to be very serious pests in Virginia. Right in the prime of their life, as seems to us, the trees begin to die and on pulling them up we find it due to woolly aphid or crown gall that was on the nursery stock when it was planted. If you do not have, you should have, very strict regulatory measures concerning these pests.

There are some apple diseases in Virginia which we cannot control by spraying: This "brown spot" is one. It attacks the York Imperial most of all, and is apparently the same as your "Baldwin spot." This year I presume we lost 30 per cent of No. 1 York Imperial apples by the brown spot. It is what botanists call a physiological disease, which means that it is a case of plant indigestion. Apparently it is associated with an excess of nitrogen in the soil or an excessive vegetative growth of the tree. We find spot most abundant on young trees that are growing very fast. We also find it in orchards that are heavily fertilized, and on trees that are not heavily loaded. It helps to control the spot on the York to grow the trees slowly, and not

over-stimulate them by too much tillage or heavy fertilizing. If we allow the tree to load heavily, instead of thinning them out, there will be much less spot.

Here is an apple which is perfect and another which has been disfigured, dwarfed and russeted by spraying with Bordeaux mixture. Practically no Bordeaux is used in Virginia now except in late summer sprayings for bitter rot. The introduction of the lime sulphur solution for summer spraying has greatly simplified orchard spraying. It was tedious to make and apply Bordeaux. The introduction of lime sulphur as a summer spray has caused more people to spray than would have been possible had Bordeaux remained our standard summer spray.

*Thinning.* I have not been able to get old apple trees to bear every year by thinning and I have been trying six years. Old trees are set in their ways. I do not doubt young trees can be made to bear pretty regularly by thinning, but trees which have had their own way for twenty years, bearing alternate years, as most of our Yorks do, cannot be made to bear every year, except with great difficulty.

There are two things to keep in mind in thinning. One is to thin enough so that you get a grade of apples two and one-half to three inches in diameter; very large apples are not as desirable as they do not store as well; thin to secure size and color. The other is to thin so that the limbs will not break. How much more it will pay to thin I do not know. I do know that with the York Imperial, which is much subject to brown spot, the more you thin the more spot you have; I have abandoned the thinning of the York Imperial, except weak trees and those that are excessively loaded. The Winesap, on the other hand, can be thinned to advantage. York Imperials loaded heavily make first-class storage stock, free from brown spot, but if thinned to eight inches apart, as advised in the west, the result is likely to be over-grown, punky and spotted fruit. It depends on the variety and the conditions.

*Harvesting.* This is the old way of packing apples and still the most common method, by running them over the table in the orchard. It is open to the serious objection that the fruit and the men are exposed to the weather. We often have hot days at harvest and the apples go into the barrel warm. It takes

a long time to cool them down in storage. Our growers are coming to prefer the central packing house in the orchard.

This is one of my teams hauling apples to the packing shed. They are picked in half-bushel willow baskets and not shifted until dumped upon the packing table. I prefer these baskets to boxes because the less apples are handled the better. Moreover, willow baskets can be tossed around without breaking; boxes have to be handled carefully. The baskets are carried to the packing shed on a wagon holding one hundred baskets, so I can take seventeen barrels of apples to the packing shed each trip if necessary.

*Sizing Machine.* My packing shed for a forty-acre bearing orchard is about fifty by thirty feet. The sizing machine is run by the gasoline engine taken off the spray pump. I can say after three years' trial, that I can put up apples cheaper and better in the packing shed than running them over the table in the orchard. I thought it would cost more, but I find that unless the haul to the shed is over half a mile, I can put them up cheaper. The men are more comfortable, and the machinery in motion keeps them spurred up to their work. I get more work out of them and they do it better.

The next picture shows the machine that I have used for three years—the Schellenger. It is expensive, costing \$225, but I think it does better work than any other. There are cheaper machines on the market, however, which do good work. The sizing is done without the slightest bruising. The advantage of the sizing machine is that the packer does not have to think about size at all; he has only to think of color and blemishes. That means he can do a much better job of grading.

*Apples of a size.* Instead of packing apples 2 1-2 inches up, we pack 2 1-2 inches to 3 inches, and 3 inches up. This gives a much more attractive pack, and there is a gain in bulk as well. Take a thousand barrels of apples packed 2 1-2 inches up and divide them into several sizes, differing by a quarter of an inch, and they will pack out 1,025 barrels, perhaps 1,050 barrels, since there is more space between apples. From every point of view that is all right; we are giving the buyer a good deal and we get more quantity.

This shows the Hasdil sizer which is used considerably in Virginia and costs about \$125. I think it has not the capacity



of the Schellenger. We ordinarily run 250 barrels a day through our machine; but sometimes as many as 325 barrels.

*Apple packages.* For the special or personal market, the box pack is all right, but there is a limit to the amount of the box apples that can be handled to advantage. In Virginia there are fewer apples boxed now than five years ago. The past four years Virginia apples have paid better in barrels than in boxes. I shall not box except special varieties like the Mother. We are catering to the wholesale trade and most of our apples had much better be in barrels. Until a grower can produce around 90 per cent of his crop fancy stock he had better let box packing alone.

We have our troubles with labor, as I suppose you do. A large part of the local help available is not altogether dependable. I have found it necessary in handling a large orchard, packing an average of 4,000 barrels each year, to have dependable help, so I get a force of men from elsewhere and camp them on the farm. Then whether you want to work one hour or ten hours, they are on hand. I find it is the best solution of the labor problem.

One end of the packing shed is used as a cooper shop. Some years it is hard to get apple barrels. Occasionally we have had to hang around the cooper shop until nine o'clock at night, waiting for a chance to get barrels. Two years ago I decided I had done enough of that. Now I get the stock in car lots and make my own barrels. This year I ordered cooperage stock for four thousand barrels. It cost me twenty-two cents a barrel laid down at Fisherville, and it cost five cents a barrel to make, so the barrel cost me twenty-seven cents. These barrels were just as good as those sold by the local cooper shop for thirty-seven cents. This ten cents saved is worth just as much as getting ten cents a barrel more for the apples. One of the advantages of large operations is that you can save in these ways.

I have found that it costs me, one year and another, with seven years' records available to date, \$1.15 to grow a barrel of York or Ben Davis apples and put on board the cars. The average selling price has been \$2.65 f. o. b., Fisherville, the last seven years. This may not seem large to you, but remember it is wholesale apple growing. This gives a fair margin of profit; if I can do as well as that in the years to come I shall be satisfied. But the boom days, when everybody was excited and putting out apple orchards, are over. You will not find



twenty acres of young apple orchard at Hood River selling for \$20,000 now. That was a purely speculative value, a real estate value, not based on the actual income from the fruit itself over a long series of years. There are men who are going to get discouraged and quit. These men will draw a long face and tell you there is no money in growing apples. But there are other men who will stay with the business year in and year out, who will not accept as the final verdict on the profit in apple growing the returns of any one year or two years, but who are in the business for a lifetime, and who propose to stay with it through fat years and lean years. These men will be in a position to take advantage of years of good prices like 1915. Last year we could hardly get \$1.75 a barrel for apples; many were discouraged, and some even pulled out the young orchards. This year apples are bringing from \$3 to \$3.50 a barrel.

A man who goes into apple growing as a business proposition should make a good living from it. But the man who goes into it on a speculative basis only, as a get-rich-quick proposition, will be disappointed.

There are over a hundred varieties of apples grown in America that are of large commercial importance. Tonight I wish to pay tribute to one that stands near the head in the amount of money that it has put into the pockets of apple growers. I would take off my hat to the New England Baldwin.

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WEDNESDAY MORNING.

### ADDRESS OF PRESIDENT.

W. H. CONANT, Buckfield.

*Ladies and Gentlemen:*

Another year has rolled around and we are again gathered in annual session and, in behalf of the officers and members of this society, I want to thank the Portland Chamber of Commerce and the citizens of Portland for their untiring efforts and generosity which assured the success of this meeting.

We are gathered here today to review briefly the past, and to consider present and future problems of vital importance to the fruit industry of the state.

The year 1915 will go down in history as the most unfavorable season for the fruit grower recorded in recent years. The spring opened full of promise and, with nearly a normal bloom and a good set of fruit, the prospects were favorable for a fair crop; but our hopes were soon blighted, for, on June 3, came a heavy frost which ruined fifty per cent of the young fruit then set and unfavorable weather conditions which prevailed through the growing season have reduced the crop to about twenty per cent of a normal yield. Yet, with all the extremely wet and unfavorable weather conditions under which fruit has grown, there is little evidence of apple scab. Especially is this true where thorough spraying has been practiced.

A large amount of injury has been done to fruit the past season by insect pests—such as the apple worm, bud-moth, apple maggot, aphid and tarnished plant bug—a large percentage of which can be controlled by thorough and intelligent spraying.

Every orchardist should make a careful study of the life history of these orchard pests and use his best efforts to control them, thereby increasing the yield and improving the quality of the fruit produced.

The storage problem is an important one with every commercial orchardist.

What is the most economical storage?

To what advantage is cold storage?

How can we prevent storage scald?

What varieties should be stored?

Would a pre-cooling plant at shipping points be a paying proposition?

Such important questions are continually coming up in seasons of large crops.

An appropriation was asked for, at the last session of the legislature, to provide an experimental storage plant at Highmoor Farm, believing that much valuable information could be secured by our experiment station on this important subject. The measure was poorly supported and, consequently, was defeated. Nevertheless, the subject is a live one, on which I hope we may have a free discussion by the members of this society during these sessions.

I want to call your attention to the fact that through the organized effort of this society the yield and quality of the

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Maine apple shows wonderful improvement. An apple-grading-and-packing law has been enacted, standardizing the products of the Maine orchard, and has raised the standard of Maine fruit in the markets of the world.

Now the next all-important step is cooperation, or business organization in marketing and distribution. Under present methods of marketing, there is too much fruit concentrated on certain large markets which soon become congested, resulting in a tremendous loss to the grower or shipper.

Without doubt this is the greatest problem facing the fruit growers of New England today, and I certainly believe the first step looking to a solution of this problem is cooperation, and on no other basis can a satisfactory system be worked out. But with live fruit growers' associations in all the larger apple-producing districts, affiliated with a central exchange, a system of distribution could be worked out that would spell "success" to the fruit industry of Maine.

Fruit growing is becoming a business and, in making up the program for this meeting, subjects have been chosen which represent the business or commercial side of orcharding.

On account of the extremely busy season at which our annual meeting is held, a small percentage of our members are able to attend. I would, therefore, recommend for your consideration the advisability of holding our fruit show in November, as in the past, and the annual meeting and lecture course in January, at some railroad center, when it would be possible to have a much larger attendance and a more satisfactory program could be arranged for a meeting at this time.

I would also recommend that a greater effort be put forth to secure an earlier publication of the annual report. The valuable information and important data gathered at these meetings on such timely subjects as orchard management and spraying should be published, either in annual report or bulletin form and mailed to every member by April first, or before their orchard operations commence, as, under our present system, much of this valuable data becomes ancient history before it reaches the hands of the growers.

As this closes my two years as president of this society, I want to thank the officers and members for the loyal support

given me at all times, and all who have contributed in even the smallest degree to the success of my administration. I sincerely hope the same spirit of cooperation that has prevailed in the past will be accorded my successor, and I pledge my hearty support in all his efforts to build up the fruit interests of Maine.

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## SPRAYING TO CONTROL INSECTS IN THE APPLE ORCHARD.

G. E. SANDERS, Field Officer for Nova Scotia,

Dominion Entomological Branch, Annapolis Royal, N. S.

In talking on the control of insects in Maine apple orchards I am not, of course, never having been a resident of Maine, in a position to map out a complete iron-clad spray calendar. I have worked on the life histories of several of your insects found in Nova Scotia, Ontario and Illinois. Conditions in Nova Scotia are probably more nearly like Maine conditions than either of the other two, and on a number of your insects I can possibly give you some information. In an apple orchard we have a number of things to consider—fertilizing, pruning, frost protection, spraying, thinning, cultivation, etc. It is almost impossible to say, offhand, which of these is most important in any one locality. The more I see of orchards in various localities the more I am impressed with the fact that each and every problem, to give the result its greatest value, must be worked out locally and its importance, in comparison with others, weighed locally. For instance, in my home province, Nova Scotia, a man can do pretty nearly anything he wants, or neglect almost anything; but if he sprays thoroughly he can depend on paying crops of fruit. I can show you orchards that have never been pruned, others that have never been fertilized, others never cultivated, etc.; but in every case, if the orchards have been sprayed thoroughly, the owner is making money out of his fruit. But I know of no orchard, no matter how well cared for otherwise, that is paying where spraying is not practiced. Last July, my good friend, Mr. Yeaton, your agricul-



tural agent in Oxford county, drove with me through nearly 100 miles of your orchards, and I must say that Mr. Yeaton is doing work in Oxford county that deserves the highest commendation. While on that drive I was impressed with the importance of cultivation, or the conserving of soil moisture and the importance of frost protection, as well as the value of spraying. But as the other two are out of my province I shall confine myself to spraying only.

In spraying for insects we try to arrange our sprays so as to coincide with the sprays for fungous diseases and so make one application do for both. Mr. Yeaton tells me that you, as a rule, apply three sprays in your best orchards; the first, dormant, for blister mite; the second, pink bud for blackscab; the third, immediately after the blossoms for codling moth. The two sprays, one before and one after the blossoms, are, above all others, the two that control the spring insects on the orchard and are the two that we depend upon in Nova Scotia to pay about twice over for all of the four or five sprays that we apply in insect control alone. Then, if it is a wet season and black spot is bad, our profits from controlling black spot may be added to the hundred per cent that we have already made in controlling insects; in other words, the insurance against black spot, which sometimes spoils 80 to 90 per cent of some varieties, we regard as absolutely free. We have paid twice over for our spray in insect control. The extent to which this is true in Maine orchards of course depends upon the number of insects present; and, before going further along this line, I shall go into the life histories of some of your most important insects.

Your President, Mr. Conant, and Mr. Yeaton have asked me to take up the following insects which they consider important, in the order named: Codling moth, bud-moth, fruit or apple worm, tent caterpillar, canker worm, oyster shell scale, San Jose scale, fall webworm, red humped caterpillar, yellow necked caterpillar and tussock moth.

#### CODLING MOTH.

This is the insect that causes the ordinary wormy apple. It passes the winter as a larvæ in a fine cocoon under the rough



bark of trees, in boxes about packing houses, etc. In the spring it pupates and about the time the blossoms open the first adults emerge and begin depositing their eggs on the apple leaves—the eggs are very small silvery scales, deposited on either side of the leaf. After the blossoms fall a number of eggs are deposited on the young fruit, but the majority are deposited on the leaves and a large proportion of the young larvae feed extensively on the leaves before entering the fruit. Often they enter the fruit at the blossom end before the calyx cup closes and entomologists for years have dilated on the importance of getting the calyx lobes filled with poison before the calyx cups close.

According to Siegler and Simanton, in Bulletin 252 of the United States Bureau of Entomology, from one to two per cent only of the first brood of codling moth in Maine pupaes to form a second brood. So the second brood is of no importance, where the spring brood is controlled. The spray recommended for codling moth is lead arsenate, two to three pounds to 50 gallons of water, applied as soon as the blossoms fall. This spray properly applied will control some 95 per cent of the codling moth, under ordinary conditions.

Another spray which I have seen recommended, but which I found controlled over 70 per cent of the codling moth in Nova Scotia, is that applied immediately before the blossoms. The fact that this spray controls so much codling moth shows that the codling moth feeds on the foliage to a much greater extent than we ever suspected. It also shows us that if we are to get the maximum control of codling moth we must apply a poison spray immediately before as well as immediately after the blossoms.

The codling moth in Nova Scotia has demonstrated to us in a most striking manner the injury which our neighbors are doing us by not spraying, as well as the benefit that they get free from our spraying. When I can first remember, twenty years ago, the codling moth was the principal insect pest of the Annapolis Valley. At that time only an occasional orchard was sprayed. At the present time 87 per cent of the orchards in Kings county and 63 per cent of the orchards in Annapolis county are sprayed and in my 'five years' work there I have

never seen over five per cent of the apples from an unsprayed orchard infested with codling moth, while in the sprayed orchards we often get only one wormy apple in five thousand; at the same time, in Queens county, where there are some large orchards and practically none of them sprayed, the codling moth will often infest 30, 40 or even 50 per cent of the crop. This shows us conclusively that when we spray we control a lot of codling moth for our neighbors who do not spray, and conversely, they breed a lot of codling moth to fly into our orchards and reduce the efficiency of our sprays.

#### BUD-MOTH.

This insect, Mr. Yeaton tells me, has done you more damage during the past season than all of your other insects combined and therefore merits very serious consideration.

The life history is as follows: The adult, a very small, ashy gray moth, flies during July and deposits its small silvery scale-like eggs, singly, on the under surface of the leaf. In about two weeks the young larvae emerge and crawl to the midrib on the nearest large vein and there eat their way into the tissue of the leaf, feeding up to the top row of cells, leaving only a tissue on the upper side of the leaf; while on the under side it spins a silken web, incorporating into this the downy hairs of the under surface. If two leaves touch each other the young larvae will tie the two together and feed off the surface of each or, if the leaf touches an apple, the bud-moth will tie the leaf to the apple and feed off the surface of both the leaf and the apple, eating through the skin and spoiling the keeping qualities even more than black spot. As a rule, from one to three apples are injured in this way in the fall for every ten per cent of the buds infested with bud-moth the previous spring.

About the time the first killing frosts occur, the young bud-moth larvae, for the most part now in the third stage, crawl back the petiole and select crevices in the fruit spurs, often under old bud scales, and there form cocoons in which to pass the winter. When the buds swell in the spring the young bud-moth larvae emerge from their winter cocoons and bore into the tips of the open buds. As the bud opens and the leaves unfold

the bud-moth selects one leaf and feeds on it, usually killing it and later, crawls out and ties down another and another as the season goes on. As a rule, it does extensive damage to the blossoms but very seldom prevents bloom, absolutely, in a bud. From our observations, about 35 per cent of the blossoms in the buds infested are noticeably injured, but the real injury is more extensive as we have proved, amounting to from 75 to 80 per cent reduction in set in the blossom clusters infested with bud-moth.

In one case, on Wagners we found 1,205 apples set in 1,000 blossom clusters free from bud-moth, while in 1,000 clusters infested with bud-moth we found only 305 apples set. In another observation on Wagners, we found 223 apples set in 100 blossom clusters free from bud-moth, while in 100 clusters infested with bud-moth we found only 45 apples set. As over 90 per cent of the buds in this last orchard were infested with bud-moth, you can see that the set of fruit in it was reduced by 78 per cent on account of bud-moth. About two or three weeks after the blossoms fall the bud-moth pupates in the cluster of dead leaves that it has gathered about itself and in three or four weeks emerges an adult moth, to deposit its eggs for the next year's brood.

Some varieties are much more heavily infested than others. Crinkly twigged trees, such as Ribston Pippin, Early William, Wagner and Nonpareil, invariably have more bud-moth in them than clean-limbed trees, such as Northern Spy, Ben Davis, Stark, etc. The difference seems to be accounted for by the fact that the crinkly twigs offer better hibernating quarters for the young larvae.

#### CONTROLS.

The bud-moth has proved one of our most difficult insects to control. In orchards that have been carefully sprayed for a number of years we find, often, only one or two buds infested in a thousand. In other orchards, unsprayed or carelessly sprayed or even well sprayed for only one or two years previous, we often find infestation ranging from 20 to 95 per cent of the buds infested. I know of no method whereby a man can entirely rid his orchard of bud-moth in one year, but I can

guarantee that thorough spraying, followed for a few years, the infestation will be cut to at least one-half of one per cent.

We found the spray formerly recommended for bud-moth, applied when the buds are swelling, to be practically worthless as a control. We also found that a spray applied from one to five days before the blossoms open would control more bud-moth than any other spray we could find. This is accounted for by the fact that the larvae, after the bud unfolds, is constantly tying down new leaves and, if we have these young leaves coated with poison before they are tied down, the larvae feeding on them will be poisoned. We also find that the codling moth spray, applied immediately after the blossoms, controls a large number of bud-moths.

This year we tested the new Friend drive nozzle, at a pressure of 200 to 225 pounds, on bud-moth and we found that the coarse driving spray produced by this nozzle increased our control of bud-moth immensely. Where we used the same solution, under the same pressure and on the same varieties, once before the blossoms, with a nozzle of the ordinary misty or Whirlpool type, we got 51 apples set in 100 blossom clusters. Where we used the drive nozzle, we got 122 apples set in 100 blossom clusters infested with bud-moth. A large proportion of this increased set proved false, as would be expected, since the cluster was weakened to a certain extent by the work of the bud-moth before the spray was applied. The amount of fruit picked has not shown this difference, partly due to conditions which entered into the experiment later in the season, so nullifying the result of the drive nozzle on the bud-moth. But the difference in set, taken ten days after the blossoms fell, demonstrates the superiority of the drive nozzle over all others in bud-moth control.

This year, for the first time, we tried some of the powdered arsenate of lime against arsenate of lead, on the bud-moth, with gratifying results. We found that it killed more bud-moths and also killed them more quickly than the arsenate of lead. For a heavy infestation of bud-moth, I would, therefore, recommend the use of the drive nozzle with a pressure of 200 to 225 pounds from one to five days before the blossoms, using as a poison two and one-half to three pounds of arsenate of lead or three-fourths of a pound of arsenate of lime to 50



gallons. If the infestation is bad, use the drive nozzle for the bud-moth spray; if less than 15 to 20 buds per hundred are infested, the ordinary nozzle will do enough effective work. A person can cover a tree more quickly with the ordinary nozzle, so the drive might only be used for serious outbreaks of bud-moth.

#### FRUIT AND APPLE WORM.

This insect is sometimes referred to as the green apple worm and is the insect that bites holes in the young apple from the time it sets until it is as large as a walnut, causing a portion of the fruit to drop to the ground, the remainder of the holes healing out to form rough scars on the fruit. There are several species, almost a dozen in Eastern America, which do this damage, mostly belonging to the Genus *Xylina*. In New York state, *X. antennata* and *X. lacticinera* are the most common. In Nova Scotia, *X. bethunei* is the principal species, although we have most of the others. The life histories and habits of all the species are similar. Passing the winter as an adult, they come out in the spring and, after flying for two or three weeks, they deposit their eggs, just when the buds are bursting, singly on the under side of the outer tips of the apple twigs, about one inch back from the tip. In about seventeen days, or just before the blossoms open, the eggs hatch and the young larvae emerge and feed on the apple leaves for almost two weeks before attacking the fruit; and it is right here that we have our best opportunity to combat the fruit worm—when it is eating the greatest amount of surface for a meal and when it is still a very young larvae.

After the blossoms fall the larvae begins to feed on the fruit, eating holes into the side, and it becomes very hard to poison as it eats so little surface at each meal and, being a large caterpillar, it takes more poison to kill it. A certain proportion of the holes eaten into the apples heal out and form scars on the surface of the picked fruit. A large proportion of the apples eaten into, 72 per cent by actual count, drop as a result of the injury; so, for every three apples you pick which have been eaten into by the fruit worm, you can reckon that seven have dropped to the ground as a result of that injury. About four or five weeks after the blossoms fall the fruit worm drops to



the ground and pupates about one or two inches below the surface and emerges as an adult in September, flies about until winter and hibernates under rubbish.

The two sprays which are effective in fruit worm control are the one immediately before the blossoms open and the one immediately after the blossoms fall. We get from 60 to 75 per cent reduction in fruit worm injury in Nova Scotia from these two sprays.

The fruit worm adults are among our strongest flying moths and flying for such a long period in the fall and spring, we would expect the wind to be a great factor in the distribution of this insect. In examining various orchards we find this to be the case. We find wind-swept orchards, as a rule, fairly free from this pest; while orchards protected in hollows by hedges, etc., where moths blow in but do not blow out, are invariably most heavily infested.

#### TENT CATERPILLAR AND CANKER WORM.

These two insects I shall take up together, as a good orchardist would consider them as jokes rather than as serious pests. They put me in mind of the old Irishwoman who said that "Willy was the best natured one in the whole family, if you only gave him his own way." So these two insects are the most easily controlled insects in the orchard, if a person only sprays properly and at the right time. Orchards that are sprayed regularly from one to five days before the blossoms with the ordinary strength of poison will become badly infested with either of these insects. If, by any chance, you have an orchard badly infested with tent caterpillar and you think it will cause serious defoliation before your regular spray goes on, spray just as soon as they have all hatched, that is, when the leaf is the size of a ten-cent piece, with two and one-half pounds arsenate of lead and one and one-half gallons of lime sulphur to 50 gallons and soak the trees thoroughly. On the young caterpillars the lime sulphur acts by contact and will kill nearly all of them. The arsenate of lead will account for the remainder.

If you have so much canker worm that you are afraid of your trees being defoliated so much by their early feeding as to leave no leaf surface for spray to adhere to, tanglefoot the

trunks of your trees about a week before the leaves fall, or even at the present date would catch a lot of the wingless females as they ascend the trunks to deposit their eggs.

In dealing with both the tent caterpillar and canker worm one should always remember that all insects are most easily poisoned when they are young, so, for ordinary outbreaks of them, spray thoroughly from one to five days before the blossoms open.

#### OYSTER SHELL SCALE.

This is one of our most common scale insects and frequently does quite serious damage to young trees. It is a single brooded insect passing the winter as an egg under the old female scale. About the time the blossoms fall these eggs hatch and four or five days later the young lice, now white, crawl out from under the old scale and scatter over the trees, in a day or so settling down and inserting their beak or sucking tube into the bark of the tree, there to stay during the remainder of their lives. A scale is soon secreted and assumes the familiar oyster shell shape and turns to a dark brown in color. In the fall the eggs are deposited by the female under the scale which has protected her during her life and there they remain sheltered for the winter. The most common recommendation for this insect is dormant spraying with lime and sulphur and I have no doubt but that your dormant or blister mite spray helps to a great extent in controlling it.

I have seen quite a lot of dormant spraying for oyster shell and have never seen any that appeared really satisfactory. Where the spray has to penetrate or tear off a scale and then destroy a mass of eggs, it seems unreasonable that dormant spraying should be expected to control it perfectly.

The best remedy in a bad infestation is to spray as soon as the young lice are all out and crawling over the trees and before they have had time to grow a protective scale over their backs. Most writers recommend black leaf 40, or kerosene, or oil emulsion for this spray; but I have seen perfect results from the use of summer strength lime sulphur and I should recommend, where oyster shell is present in any quantity, the retarding of the ordinary codling moth spray until the young lice crawl. You will get little reduction in your effect on codling

moth and control your oyster shell perfectly with the summer strength lime sulphur in that spray.

### SAN JOSE SCALE.

I hardly need emphasize the importance or destructiveness of this insect. It is a subject for a complete talk in itself, but I will only speak briefly on it. In Ontario and Illinois I have seen hundreds of acres of peach, apple and pear trees destroyed by it. In my opinion it will some day, and that not distant, be *the* great factor in reducing the export of apples from certain sections which are now producing a large proportion of our apples. When that time comes, the growers who have sprayed in those sections and all of the growers in sections that have kept clear of the pest, will reap a harvest.

The San Jose scale is perfectly controlled by one spray with lime sulphur, 1 to 10, as you use for your blister mite. I can take you to properly sprayed orchards in the Niagara district or in Illinois, in the worst scale districts, where it will keep anyone busy finding a single scale. In orchards near by you can find trees dying from scale. San Jose scale, as many other serious pests, usually acts as a blessing to the careful orchardist as he will spray enough to control the scale. The benefit he gets from his dormant 1-10 lime sulphur spray in controlling blister mite, a certain percentage of black spot or scab and other pests, will usually more than pay for his spray; and the fruit from the unsprayed orchards of his competitors will, to a great extent, vanish from the market, making better prices for his own.

In Nova Scotia, I found the first scale in the province in 1912 on recently imported nursery stock. After several meetings and consultations, the growers there decided that they had plenty of blessings in the shape of insect pests and, if there was a possible chance of eradicating the scale it should be done. I was placed in charge of the work for that season and our inspectors destroyed over 700 trees, all recently planted. Since that year a provincial entomologist has been employed who has continued the work and this year his men have found only ten trees infested, which have been destroyed, and we have great hopes that he will be able to eradicate the scale from the province. I merely mention this to show you that, should you

uncover any recently introduced infestations, the methods we employed, of destroying all trees infested, is working so well that the extermination of the scale seems in sight.

#### FALL WEBWORM, RED HUMPED CATERPILLAR AND YELLOW NECKED CATERPILLAR.

These three fall caterpillars feed at about the same season—August and September. They are all three well controlled by parasites and seldom do extensive damage, as they confine their attention, usually, to the leaves of a young tree or one limb of a full-grown tree. If they ever get so bad that hand-picking will not control them, spraying with lead arsenate, three or four pounds to 50 gallons, will control them. The best work in poisoning them can be done when they are young.

#### TUSSOCK MOTH.

This insect is sometimes very common in apple orchards in the fall. It is controlled by parasites, after being numerous for two or three years; this accounts for its regular periods of increase, extending five or six years, with a sudden decrease at the end of the period. The tussock not only feeds on the leaves in the fall, but gnaws at the surface of the growing fruit often in bad infestations, destroying one-half of the crop. The holes eaten by the tussock are easily distinguished from those of the fruit worms by their being more shallow, irregular, covering often one-quarter of the surface of the apple and, being eaten later in the season, they do not heal out so well as those of the fruit worms.

The tussock caterpillar is easily distinguished, being about one and one-quarter inches in length, hairy, with two tufts or pencils of hairs extending forward from each side of the head and one projecting backward from the tail. It also has four tufts of white hairs in a row along the back.

The sprays that you employ here are not applied at the right time for tussock control. If you notice tussocks getting into your orchards you will have to spray with lead arsenate when they begin to feed, probably about July 15. Once an orchard is ridden of them, it will take two or three years for it to become reinfested, as the females cannot fly but deposit their eggs on the outside of the cocoon in which they pupated. The





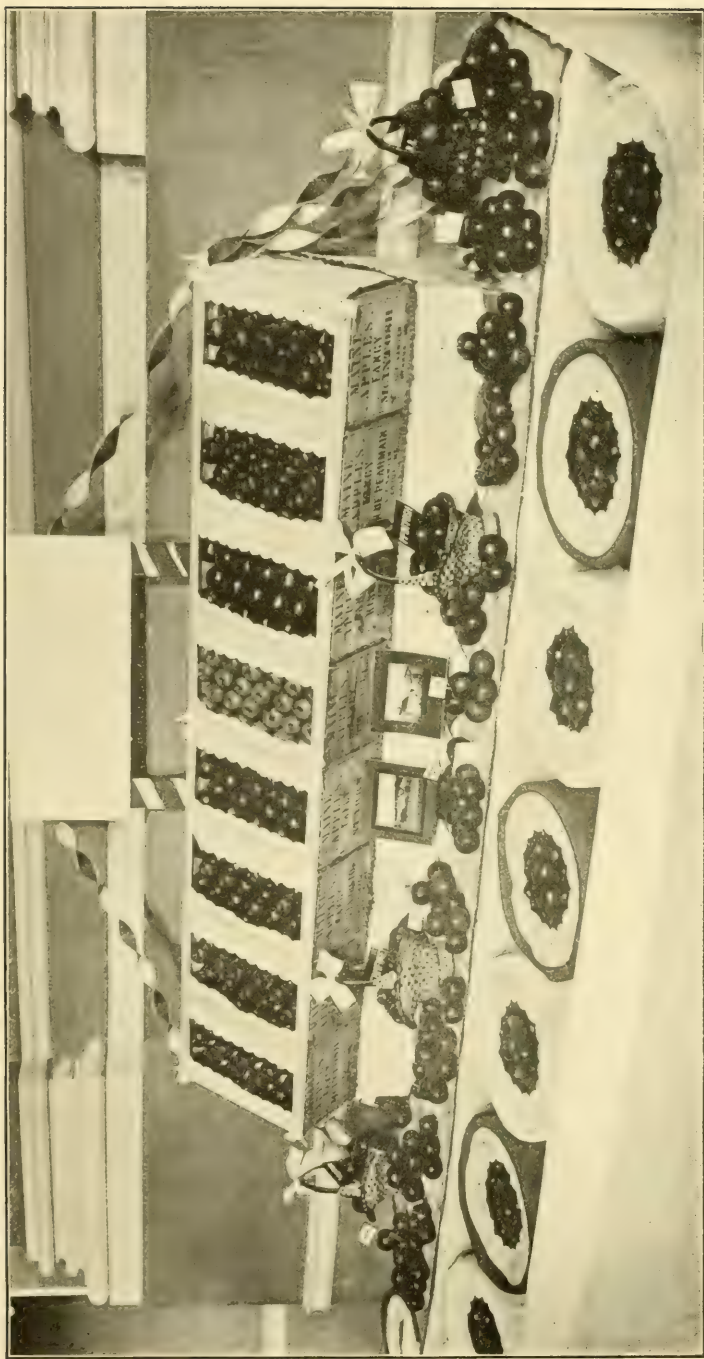


Exhibit from orchards of Charles F. Sawyer, Hebron, at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

spread of the insect is accomplished by the larvae crawling from tree to tree.

Now, gentlemen, I have talked insects long enough and still I have not touched three of your most important insects, namely: Apple maggot, aphid and plant bug. Our provincial entomologist, Prof. Brittain, is working with these three insects and is finding out a lot of new things about them. He has demonstrated conclusively that you can control apple maggot by spraying at the right time. He is doing fine work on aphid and he has done the only work worth while, still unpublished, on the "False Tarnished Plant Bug" which this year has cleaned every last apple off hundreds of apple trees in Nova Scotia. What some of our plant pathologists pronounced fire blight, destroying apple blossoms, he has shown to be almost entirely the work of the bug, in some cases carrying and assisted by genuine fire blight. He has only this season devised effectual means of control of this pest, so if you want the last word of those three insects you will have to talk to Prof. Brittain.

In regard to your spraying as practiced at present. Your dormant spray will control San Jose, if you ever get it. Your spray before the blossoms will control bud-moth, tent caterpillar, canker worm, some fruit worm and some codling moth. Your spray after the blossoms will control codling moth, some fruit worm and some bud-moth.

The benefits that you get from control of codling moth, bud-moth and fruit worm should pay for all of your sprays, two to three times over; and the control of the other leaf eaters, which are somewhat periodical, you get free and your insurance against black spot you get free.

In regard to nozzles, I believe it would be well worth your while to try the Friend Drive nozzle for the sprays before the blossoms, and the Friend Calyx nozzle for the sprays after the blossoms. They both require a pressure of about 200 pounds to work properly, but are the best I have ever seen for orchard work. The Drive I have proved conclusively will control more bud-moth than the ordinary nozzle and most of the few clean apples in Nova Scotia this year were sprayed with the Calyx nozzle after the blossoms, so it appears at least equal to the others in spot control and will put spray on a tree faster and better than anything I ever saw. Just to show you the importance of nozzles: One grower was using the misty or whirl-

pool nozzle and thought them O. K. I persuaded him to use some of the new nozzles on a portion of his orchard. He was sure they were no good but gave them a trial. He got 57 and 22 per cent spot with the old nozzle and 19 and 9 per cent spot, respectively, with the new nozzle we recommend. We are not through testing nozzles or I would speak more on them.

I do not want you to think I am mapping out a complete spray program. I have scarcely touched sucking insects or fungous diseases, and I do not want you to take any of my recommendations any further than they go, that is, for San Jose and oyster shell scales and the biting insects mentioned.

I see in your program a question list. Question 8, "Is it best to apply the dormant spray in the fall or spring?" I should like to discuss with you. I should, by all means, apply my dormant spray in the spring and, if possible, apply it after the buds have swollen and the earliest of them even showing small green leaf tips, for at least three reasons; First, according to Mr. Hodgkiss of the Geneva Experiment Station, you can control more blister mite at that time than earlier.

Second, I see by question 14 that San Jose scale is appearing in Maine. You will get better results in spraying for San Jose by applying your dormant spray in the spring, after the winter has acted on it and torn loose the outer scales and after the scales have awakened to life in the spring, than you will by a fall application which cannot do as good work, as the living scales are then protected by a certain number of dead scales; and besides, being prepared for a cold winter, the scale seems to have more vitality and, therefore, is less susceptible to spray than in the spring.

Third, you have in New Hampshire, and I think I am safe in saying in Maine, also, for we have it in Nova Scotia—the lesser bud-moth, *Recurvaria nanella*, on which Scott and Paine published such good work in the Journal of Agricultural Research, Vol. II, No. 2, page 161, United States Department of Agriculture. In this, one of the best remedies given is dormant strength lime sulphur or soluble sulphur wash just when the buds are swelling. The wash does not kill the larvae in their hibernating quarters, but when they emerge they appear to be so nauseated with the lime sulphur odor that they drop to the ground and perish, rather than stay on the trees and bore into the buds. This insect occasionally does as much

damage in an orchard as the eye spotted bud-moth, so is worth considerable when applying a dormant spray.

In closing, I want to congratulate you on the formation of your Fruit Exchange. If your experience with it is anything like our experience with our United Fruit Companies in Nova Scotia you will never regret having formed it. All of my produce is marketed and most of the supplies for my farm and house are purchased through the United Fruit Companies, and I find I can make a saving both ways and at the same time support our own organization which is working hard to improve the quality of the fruit and the pack from Nova Scotia, and is also reaching out to widen and increase the markets for our produce. I give you my best wishes for the success of your fruit exchange, which, properly managed, must mean a better living for every fruit grower in the state.

Question: What is it that causes fruit to fall that is set?

MR. SANDERS: It may be any one of a hundred different things. I do not think any one insect is responsible. It is a question of pollination. The June drop of fruit consists for the most part of apples that have one or two cells pollinated—not invariably, but usually the early drop, the size of a walnut, has only one or two cells pollinated. Later on you find more apples with three cells pollinated dropping to the ground, but most of that summer drop is due to imperfect fertilization. Your No. 1 apples should have at least four cells fertilized, with seeds in them, and, as a rule, they will have five cells; your second grade, four and three. Your No. 3, your smaller grade, I do not know just how you grade here—perhaps some with two or three cells with seeds in, sometimes of course with four, even five. There may be some external injury or overloading of the tree, but the size of the fruit depends to a great extent on the amount of pollination that has taken place in the spring; and the dropping in the spring and summer of fruit that has already set is due to perhaps only one or two of the cells being pollinated and forming seeds. Of course, one cell pollinated with seeds in it is not enough to hold the apple on the tree all summer. That is the great reason for the early drop of fruit and indicates, of course, the importance of bees in the orchard.

Question: That pink bud spray, what proportion of lime sulphur do you use?



MR. SANDERS: We use it too strong. We used last spring about 1-25, 1-30 ordinary commercial lime sulphur, and found it was too strong. We used lime sulphur too strong right straight through the season last year and did a lot of damage with our spraying material, and I do not know whether that is going to continue or not. We are recommending for this next season not more than 1-30, 1-35 for pink bud spray, and weaker for the later sprays. That is one of the things that varies with the locality, the strength that you can use lime sulphur. You might be able to use one strength in Maine and we could not use as strong as that in Nova Scotia. I would be afraid to recommend anything very definite. Be careful not to use it too strong, but how strong you can use it I would not like to say.

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## RESULTS FROM APPLE SPRAYING EXPERIMENTS AT HIGHMOOR FARM.

W. J. MORSE.

The department of plant pathology of the Maine Agricultural Experiment Station is making a special study of apple diseases. Highmoor Farm has greatly added to the facilities for carrying on this work. Several bulletins or reports of progress have appeared and in one of these, Bulletin 185, an attempt was made to cover in a fairly comprehensive manner what we had learned up to that time regarding the various apple diseases which occur in the state. The edition was soon exhausted and it is now, after five years, somewhat out of date. A revision of this publication will probably be made in the near future which will include in condensed form the more important results of recent studies and observations.

The Pomological Society was largely instrumental in bringing about the purchase of the farm by the state for the use of the station and has always shown a very lively interest in what is going on there. From a practical standpoint the members of the society are doubtless more deeply interested in the spraying experiments which have been carried on each year, from the first, than in any other line of pathological work which is being conducted at Highmoor. No report of the progress of this



work has been rendered at a meeting of this society for some time. Therefore, I am very glad of the opportunity to tell you something about what we think we have learned in recent years regarding our own spraying problems here in Maine, based on our own experience, irrespective of the results obtained in other states, and to outline to you some of the unsolved and partly solved problems which we are facing.

I shall try to give you a notion of the object, character and extent of these experiments and state as briefly as possible what seem to us as evident conclusions as well as those which are of a tentative nature. It is not my intention to burden you with the less important details or tabulated results—these are to be found in published or forthcoming bulletins of the Station—but rather to give you a summary of the results of the past three or four years, using only such figures as are necessary to illustrate the facts as they appear to us.

The primary object of these experiments centers around the efficient and economical control of apple scab with a minimum amount of injury to fruit and foliage. This involves the nature of the spray used, as well as the time, number and manner of the applications.

Great progress has been made in the control of apple scab by spraying, but under local climatic conditions there is still much to be learned. Potato growers in southern Maine who thought they sprayed thoroughly and yet suffered severely from blight and rot this past season may not agree with me, but I believe I am right when I say that efficient control of late blight of potatoes by spraying is much more of a certainty when the proper methods are used than is the case with apple scab.

Certain sprays, including Bordeaux mixture, if applied at exactly the right time, give fully as much protection from apple scab as the last named fungicide does from potato blight. This avails but little if, at the same time, the spray removes half or two-thirds of the foliage from the tree. Also in the case of Bordeaux mixture when used on susceptible varieties, like the Ben Davis, the fruit, though practically free from scab and other parasitic diseases may be 90 per cent unsalable on account of russetting. In this connection the speaker firmly believes, however, that for those varieties of apples which it does not injure or injures but slightly, Bordeaux mixture is the most

satisfactory and efficient fungicide for apple scab. On the other hand no one will deny that lime-sulphur, all things considered, is one of the best spraying materials yet devised for use on apple orchards. It was welcomed as a panacea by the enthusiasts when it first appeared, and those of us who were inclined to take a more conservative attitude then must admit that it is standing the test of time in a most creditable manner. At the same time the Highmoor experiments show that as ordinarily used, under Maine climatic conditions, it, too, has its limitations.

The Highmoor experiments have been conducted throughout with Ben Davis trees between 20 and 30 years old. In many respects this variety is very satisfactory for the purpose. It is very susceptible to spray injury and would hardly be classed as particularly resistant to scab. The number of experimental trees in different years has varied from a little less than 150 to nearly 300. As a rule each plot has consisted of 24 trees, or four rows of six trees to the row. To obtain the records of results for comparison it has been the custom to reject the crop obtained on the two outside rows, or at least on the outside half of the two outside rows. This is to avoid the effects from the spray drifting across from the adjoining plots which received a different treatment. At harvest time each individual apple composing the portion of the crop selected from each plot has been carefully examined. The total number of fruits, the number of scabby and russeted and the percentages of the latter, as well as the percentage of perfect apples, are determined. During the summer a careful record has been kept of the effects of the different sprays on the foliage.

Scale and blister mite are not troublesome in the experimental orchard so no dormant sprays have been used except as is noted later. Throughout the work the general plan has been to make the first spray application when the flower buds were showing pink, the second just after the blossoms fell and the third ten days or two weeks later. Aside from definite, intentional variations with individual plots this program has been followed fairly closely. Occasionally the time between the second and third applications has been lengthened somewhat, and once during the speaker's absence a misunderstanding led to the postponement of the "pink spray" on all but one of the plots so long that it was necessary to omit it. All applications

have been made with a gasoline power sprayer, using a nozzle which gave a fine mist and with pressure varying from 150 to 200 pounds.

#### RESULTS AND CONCLUSIONS.

*Bordeaux mixture vs. lime-sulphur.* Each year a plot has been sprayed with a 3-3-50 Bordeaux mixture and another with standard dilution lime-sulphur to which in both instances two pounds of paste arsenate of lead or one pound of the powdered form was added to each 50 gallons. For the past few years dry arsenate of lead has been used exclusively from preference. These two plots provide a base line or check whereby, in connection with a third unsprayed plot, the effects of the other treatments in preventing scab and in the production of fruit russeting and foliage injury could be determined more accurately. They have also given some very illuminating data as to the relative merits of the two sprays when used upon a variety of apples which is particularly susceptible to spray injury.

Lime-sulphur has sometimes given a little leaf injury but never sufficient to be of any commercial importance. When compared with the unsprayed check plot this treatment has increased the number of russeted apples from five to ten per cent during the past three years. Scab control has been less than with Bordeaux mixture but the greatest difference has been only about three per cent.

Bordeaux mixture on the other hand has caused serious leaf injury nearly every year for the past six seasons, sometimes resulting in partial defoliation. The greater efficiency in scab control has been discounted several times over by the increase in fruit russeting. The method of treatment which gives the greatest proportion of merchantable fruit is the one which appeals to the practical man. In the past three years the per cents of merchantable apples on the plot sprayed with Bordeaux mixture have been in round numbers 30, 10 and 21. The unsprayed check which was not even treated with an insecticide gave 30, 87 and 91 per cent of the same grade of fruit. From the practical man's standpoint nothing was gained the first year and there was a heavy loss the next two years in spraying Ben Davis trees with Bordeaux mixture. It is true

that the actual quality of the fruit was improved, but it was made unmerchantable on account of russetting.

*The effect of different dilutions of lime-sulphur.* While horticulturist of the Station, W. W. Bonns began some experiments to test the effects of different dilutions of lime-sulphur. After he left and the spraying work again came under the charge of the pathologists this was continued.

The results indicate that it is unwise to use a weaker dilution for summer spraying than is commonly practiced. Increasing the amount of lime-sulphur concentrate 20 per cent in a given amount of spray resulted in a considerable reduction of scab without largely increasing the danger of injuring the leaves and russetting the fruit. It is probable that this increase in efficiency would more than pay for the added cost of materials, particularly if the lime-sulphur concentrate is home-made.

*The importance of the so-called "pink" spray.* Some writers and speakers have laid great stress upon the importance of the spray application made when the blossom buds are showing pink. Present knowledge of the life history of the apple scab fungus and some experimental data obtained in Maine as well as elsewhere tend to support this view. Orchardists should by all means have spraying materials on hand and see that the necessary apparatus is in perfect running order so that this application may be made without delay when the proper time comes. On the other hand, in Maine they need not necessarily feel that the spraying operations for the current year are doomed to utter failure if, through accident or for some other unavoidable reason, it is omitted altogether.

Work along this line has been going on at Highmoor for four years. Two seasons out of the four, omitting the blossom bud application entirely, actually resulted in a higher percentage of merchantable apples. Another season the increased efficiency due to the first application was but slight. The differences were not great in all three cases and doubtless were within the limits of experimental error. Therefore, the omission of the first spray three years out of the four led to no material difference in the results. On the other hand, the omission of the so-called pink spray the first season it was tried meant a difference between success and failure in the spraying operations of the year. This was in 1912, a particularly bad one for scab. Where



all three applications were made 90 per cent of the fruit was sound and perfect. Only about 50 per cent of the same grade was obtained where the first application was omitted. Nearly all of the remainder of the fruit on this plot was scabby.

*Arsenate of lead as a fungicide.* Perhaps the most striking and certainly the most unexpected result of this series of experiments is the discovery of the apparently high fungicidal value of this well-known insecticide in controlling apple scab. Its value in this respect has been entirely ignored in almost all other work of this kind. In a large proportion of the apple spraying experiments conducted in this country it has been the practice to entirely overlook any possible fungicidal effect of the insecticide used in the combined spray.

At the last meeting of this society a speaker from out of the state told you in a most emphatic manner that arsenate of lead had no fungicidal value when used alone against apple scab. At that time I had already obtained figures from a series of three successive yearly experiments at Highmoor Farm from which one could draw nothing but quite the contrary conclusions. The data from the fourth of this series have just been obtained. While the test for the current year was less severe than usual, the results as far as they go do not contradict those previously recorded.

The first suggestion of the fungicidal value of arsenic of lead for apple scab came in 1912. Then four pounds of the paste form alone in 50 gallons of water gave as good or better scab control than did a 3-3-50 Bordeaux mixture of lime-sulphur plus two pounds of the paste to each 50 gallons of spray. No unsprayed check plot was available that year. The arsenate of lead plot was located at the corner of the orchard more exposed to air and sun. It was thought that this might have been a factor leading to the relatively small development of scab upon it. This factor was eliminated in the later experiments.

In 1913, an unsprayed check plot was added and dry arsenate of lead substituted for the paste. One plot was sprayed at all applications with two and another with one pound of the powder to 50 gallons of water, or equivalent to about four and two pounds of the paste form respectively. Nearly 39 per cent of the apples on the unsprayed plot were scabby. Almost perfect scab control was obtained with Bordeaux mixture, the



larger amount of arsenate of lead used alone, and lime-sulphur—the efficiency being in the order named. It should not be forgotten that one pound of dry arsenate was added to each 50 gallons of Bordeaux mixture and lime-sulphur used. This smaller amount of the arsenate when used alone reduced the amount of scab from 39 to less than 16 per cent. Therefore, it is more than a possibility that this insecticide added to Bordeaux mixture and lime-sulphur may materially contribute to the fungicidal effect of the combined spray.

A large amount of fruit russetting was experienced in 1913, apparently due to natural causes. This was considerably increased by the action of some of the sprays. With Bordeaux mixture and lime-sulphur this increase amounted to 40 and 11 per cent respectively, while it was actually less on the plot sprayed with the larger amount of dry arsenate of lead than on the check. On account of the last mentioned fact the relative value of the arsenate of lead spray was still more apparent that season. About 12 per cent more perfect apples were obtained with it than where standard dilution lime-sulphur was used.

Neither in 1914 nor in 1915 did scab develop sufficiently to give a rigorous test of the fungicidal properties of arsenate of lead. In scab control in 1914 two pounds of dry arsenate of lead in 50 gallons of water fell about three per cent behind lime-sulphur containing one-half this amount of the insecticide, *but the per cent of merchantable apples was practically the same.* In 1915 the combined lime-sulphur spray gave a fraction of one per cent better scab control, but on account of russetting only about 90 per cent of the apples were merchantable. In contrast with this, because of freedom from russetting, the larger amount of arsenate of lead used alone gave over 97 per cent of the same grade of fruit.

Do not misunderstand me. I have not reached the point where I am ready to recommend that Maine orchardists depend entirely on arsenate of lead to control both apple scab and chewing insects. I am not yet ready to advise that such action be taken with regard to the Highmoor orchards. I prefer to take a much more conservative attitude and suggest that the possibilities of arsenate of lead as a spray for scab are well worth looking into. The figures obtained during the past four years are as given and are certainly very suggestive. Time can only

tell whether or not they can be repeated year after year and the same results obtained in general practice.

*Strong fungicides for the blossom bud spray followed by arsenate of lead alone.* The high efficiency of arsenate of lead in scab control suggested the following possible modification of summer spraying practice. Use a strong fungicide combined with a smaller amount of arsenate of lead when the blossom buds are showing pink. For all later applications depend entirely on arsenate of lead, using at least two pounds of the powder or four pounds of the paste to each 50 gallons of water. Work along this line has been going on for two seasons. For the first application 3-3-50 Bordeaux mixture and lime-sulphur 20 per cent stronger than standard have been used.

The crop in each case has been very free from scab, but on account of the fact that the omission of the first application of standard dilution lime-sulphur on other plots failed to show an increase in scab, it is impossible to draw definite conclusions regarding the chief object in view. However, all the evidence obtained tends to confirm the results secured where arsenate of lead was used alone throughout the season and in previous years.

Apparently Bordeaux mixture is ruled out on the Ben Davis, even for the first application when the leaves are unfolding, and the blossom buds are not yet open. It produced more or less leaf injury both seasons. What is more strange, russetting of the fruit was materially increased when compared with the check and with the plot sprayed with arsenate of lead throughout the season. It seems hard to explain why an application of Bordeaux mixture made before the blossoms buds opened should produce a russetting of the fruit formed considerably later, but this is what the figures show. In 1914 this plot adjoined one sprayed three times with Bordeaux mixture, and it was thought that the increased russetting might possibly result from spray drifting from the latter plot. A relocation of the plots in 1915 prevented any such a possibility, but the increase in russetting appeared just the same. No such difficulties were experienced where lime-sulphur 20 per cent stronger than standard dilution was used for the first foliage spray.

*Dormant sprays for insects as affecting scab control.* A few years ago the pathologists of the Station demonstrated quite

conclusively that the scab fungus may live over winter on the young twigs of susceptible varieties like the McIntosh. Some work done by one of the officers of this society, F. H. Morse of Waterford, which came under our observation showed that a late dormant spray of lime-sulphur in addition to the regular summer applications would materially reduce the amount of scab on the foliage under such conditions.

No trouble has been experienced with scab on the limbs of Ben Davis at Highmoor, but we have been asked frequently if a dormant spray could be safely used after the leaf buds had begun to unfold and the flower buds had begun to swell. We have always advised against this, but a plot was sprayed in this way at Highmoor last season to test the matter.

As was expected, considerable burning of the young leaves was experienced and some of the flower buds were injured, a few being killed outright. These effects soon passed away and so far as could be determined the total yield of apples on the plot was not lessened. A considerable amount of russeting did appear. It happened that this plot also adjoined one sprayed throughout the season with Bordeaux mixture. Therefore, in addition to the two central rows of trees used for the regular record the two outside rows were harvested separately and the percentages of russeted apples determined. It was found that the row nearest the Bordeaux plot showed even a smaller amount of russeting than the one farthest removed, thus throwing considerable doubt on the hypothesis that the spray from the Bordeaux plot influenced the results on the one where the dormant spray was used.

*Extra fine sulphur flour as a fungicide for scab.* For the past two seasons ten pounds of very fine sulphur flour in suspension in 50 gallons of water containing one pound of dry arsenate of lead has been used on one plot in the series. This material has shown considerable fungicidal value, but is probably not practicable for the commercial orchardist.

*Copper-lime-sulphur.* Some successful experiments were reported a short time ago by the pathologists of the Virginia Agricultural Experiment Station with what they called "copper-lime-sulphur." This was ordinary summer strength lime-sulphur to which two pounds of copper sulphate was added for each 50 gallons. A test of this material at Highmoor Farm

in 1914 led to fully as much foliage injury and fruit russetting as where Bordeaux mixture was used. The effects were very disastrous, indeed.

*Proprietary compounds.* It is not the policy of the Station to attempt to test indiscriminately the various proprietary compounds which are placed on the market from time to time for orchard spraying. However, for special reasons two of these have been included in recent experiments.

One was a dry powder much advertised and sold in the state as a substitute for lime-sulphur. The manufacturers did not claim this in their advertising matter, but many orchardists purchased and used the material under the supposition that it was identical with lime-sulphur, except that all of the water had been removed. The first year at Highmoor two pounds of the powder and one pound of dry arsenate of lead were used in 50 gallons of water. Efficient scab control was secured, but the effects on the foliage were disastrous. The experiment was repeated the second year but the amount of the fungicide was reduced to three-fourths pound to 50 gallons. The results were practically the same as before. No attempt was made to test the efficiency of the material as a dormant spray.

The other material was in the form of a paste. Seven pounds of this and the same amount of water and arsenate of lead were used as in the last mentioned experiments. Both seasons this compound controlled scab very well and no injury to fruit or foliage was experienced.

#### CONCLUSION.

A brief summary or restatement of the essential facts which have been presented may be of service.

Locally it is not always safe to generalize too much upon results secured in or to adopt without reserve conclusions derived from work done in other parts of the country or abroad under different climatic and soil conditions. Also, in some instances these conclusions have been based upon a relatively small number of trees, the results of a single season, or at the outside limited number of seasons. At Highmoor, the Ben Davis, a variety which scabs readily and is quite susceptible to spray injury, is used. A relatively large number of trees are



included in the experiments, and the latter are planned to cover an indefinite series of years.

While Bordeaux mixture is a very satisfactory fungicide to use on resistant varieties, it has been shown at Highmoor, in conformity with the almost universal experience under like conditions elsewhere, that it is very unsafe to use it on those varieties which are particularly susceptible to spray injury. It has given good scab control, but on account of russetting the yield of merchantable apples has averaged less than where no spray whatever was applied.

Standard summer dilution lime-sulphur controlled scab nearly as well as 3-3-50 Bordeaux mixture and produced very much less fruit russetting. Slight leaf injury occasionally occurred but this was negligible from a practical standpoint. Increasing the strength of the lime-sulphur summer spray 20 per cent increased the percentage of merchantable apples for three successive years.

Timely application of the so-called "pink spray" is important and essential for safety, but its omission three years out of four led to no increase of scabbed fruit. Decidedly contrary results were obtained one season.

The use of arsenate of lead alone, slightly in excess of the amount commonly applied as an orchard insecticide, has unexpectedly given very satisfactory scab control for four successive years. These results are simply suggestive—it is still an open question how far Maine orchardists should depend upon it as a fungicide for scab.

The discovery of the apparent fungicidal properties of arsenate of lead suggested the following modification of the usual spraying program: Use a relatively strong, well-recognized fungicide combined with arsenate of lead, just before the flower buds open, followed by the stronger arsenate of lead spray alone for later applications. For two successive years seasonal conditions have made the results from this part of the work inconclusive from the standpoint of the primary object. They do appear to confirm the tentative conclusions regarding the value of arsenate of lead in combating scab. Also from them it is apparent that Bordeaux mixture is ruled out, even for the single, early application, on account of increased russetting of the fruit.



One trial of dormant strength lime-sulphur after the leaves began to unfold caused injury to both the young leaves and flower buds, but apparently the fruit crop was not lessened. However, the latter showed an abnormal amount of russetting.

A suspension of very fine sulphur flour showed considerable fungicidal value, but its use is probably not practicable for the commercial orchardist.

Copper-lime-sulphur produced as serious foliage and fruit injury as did Bordeaux mixture.

Two proprietary spraying compounds tested gave good control of scab, but one of them caused serious leaf injury and defoliation.

## PROBLEMS OF A COMMERCIAL APPLE GROWER.

S. W. FLETCHER, Fisherville, Va.

*Mr. President, Ladies and Gentlemen:*

If you will look at the program you will notice that my subject is problems of a commercial apple grower. That means it is personal. If I had come to you fifteen years ago to talk on this subject, when I was just out of college, I have no doubt that I could have told you collectively and individually just how you ought to do to raise apples, without even visiting your farm. But I have travelled since then, been up against the rough edges of practical work in endeavoring to make a farm pay, and I know now, as doubtless you know, that these problems are personal and individual. All I shall attempt to do is to tell you how I have met these problems on my farm; possibly my experience may have some application to yours.

*Cost of Production.* The biggest problem in apple growing, as I see it, is to keep down the cost of production. The days when apples brought five dollars a barrel, as average return, are gone, never to return. Every fruit has passed through boom days and periods of depression. It was so with the orange, the prune, and the grapefruit; it has been so with the apple. A few years ago, between 1908 and 1912, everybody was getting \$3 or \$4 a barrel for apples. Now most of us are satisfied if we net \$2.50; at least, in the wholesale apple country where I am located. Some years, like this one, we get more. We have

come to the time when the man who makes money in growing apples is the man who can produce good fruit at a low cost. With increasing competition, every business man endeavors to cut out the wastes, to eliminate the unnecessary expenses, to produce a good article at as low cost as possible. This is our biggest problem, aside from that of marketing, which I shall not discuss. The points I shall mention this afternoon have to do mainly with means of growing good apples cheaply.

*Location.* It is a great advantage to be located where you can get your apples to market at a reasonable cost. This means that you must have, if you can get it, competing means of transportation. I am fortunate in having three competing railroads within five miles of my orchard, and while I ship mostly over one railroad, I am satisfied that the fact that there are competitors keeps my rate reasonable. You have heard that competition is the life of trade. Competition is also the chief incentive to reasonable freight rates. In selecting a location it will be a decided advantage not to be at the mercy of any one means of transportation.

The distance of the orchard from the shipping point, and the character of the road, have much to do with the cost of production. I showed you last night pictures of Virginia growers hauling apples twenty miles over rough and hilly roads, paying forty-five cents a barrel to put the apples at the depot. I am located one-quarter of a mile from the depot, on an asphalt road, and it costs less than two cents to put a barrel of apples on the car. This is a big advantage. I could sell my apples for \$2.50 a barrel at the depot and make as much as this other man if he sold for \$3. An apple grower ought to be a good roads man. We have had a quarter million dollar bond issue which was used to macadamize the main roads of my district. I now carry thirty-five barrels of apples on a two-horse load to the depot over that good road; formerly I carried about fifteen. I save my increase in taxes on account of the bond issue a great many times over every year on that one thing alone. The fruit grower has such a bulky article to carry to market that he should be a worker for good roads as a matter of self-interest, if for no higher reason.

*The Site.* The site of the orchard may influence the cost of production. You know of the intense interest in the western

states in smudge pots for frost protection. It sometimes costs \$50 an acre to equip a western orchard with the means of protecting it from frost. Now how much more economical it is for us in the east to select a location which is sufficiently elevated above the surrounding country to secure practical immunity from frost. We have in Virginia many hillsides and mountains which have on them what we call the thermal belt. This is perhaps half way up the mountain side, ranging from one-quarter of a mile to a mile in width. No frost ever occurs in this belt. The cold air coming down the mountain, being heavier than warm air, settles underneath the warm air in the valley, and pushes it up until it stands at a certain level against the mountain side. That is where the frostless zone occurs. You may not have conditions like that in Maine, yet you know there is a great difference in the ability of different sites to resist frost and you give preference to the uplands. Frost immunity has much to do with the cost of producing apples. I have had a crop of apples every year for seven years; this makes my cost of production lower than it would have been had I missed a crop every now and then.

*Varieties.* I do not need to urge you to grow the standard varieties and not the novelties. Grow the varieties which are tried and proven in Maine, and your market demands—not what I tell you are best in Virginia. There are four standard sorts in Virginia: the York Imperial, Albemarle Pippin, Wine-sap and Ben Davis. The York Imperial is our Baldwin, the great commercial apple, bearing large crops of fair quality apples under average care, and selling at good prices. The Albemarle Pippin, which is very much higher in quality, is our great export variety. Practically all of them are sold in England, sometimes at very high prices. Some years they bring \$8 and \$10 a barrel, but the average is not more than \$4. Although this variety often sells for twice as much as the York, the York is frequently more profitable because it costs so much less to produce it. The York will bear nearly twice as many apples, year after year, as the Pippin. It requires only three sprayings, while the Albemarle Pippin needs three more to protect it from bitter rot. This shows that it is not the price you get for apples that measures the profit; it is the difference between the cost of producing the apples and

the selling price. The Winesap is the Spitzenberg of Virginia; of high quality, keeping late into June, and a very desirable late-storage variety.

*The Ben Davis.* I will not forget the Ben Davis, specimens of which I have brought here, not to make myself an object of ridicule to you who grow the Baldwin but to illustrate this point—grow varieties which are most adapted to your locality. I think you can see by these specimens that Ben Davis is at home in Virginia. It grows to a large size, has good color, and good keeping qualities. It is fully developed and matured. It seemed to me, as I looked over some of your Maine Ben Davis in the excellent exhibit downstairs, that it is questionable whether you are wise in growing Ben Davis, commercially. You can grow Baldwins infinitely better than we can; it would be foolish for us to attempt to grow Baldwins in competition with you. I think it is equally foolish, if I may be permitted to suggest it, for you to attempt to grow Ben Davis in competition with us. The Ben Davis needs a longer season than you have in Maine. Ultimately each section will see the wisdom of growing only the varieties which can be brought to the highest degree of perfection in that place, rather than attempt to grow varieties which have acquired a reputation elsewhere.

Our Virginia Ben Davis has the same delightful sawdust flavor inside of it as those you grow in Maine. I don't know as the quality is any different. But it sells. We send it to the extreme south—to Mobile, Birmingham, Atlanta and New Orleans. In that hot and trying climate, the groceries can put it on the fruit stand and it will look good two weeks later, when more tender varieties would go down quickly and not be salable. For selling in hot climates, for putting on the market in late spring, after other and more desirable kinds have gone, the Ben Davis, if grown where it reaches its own peculiar standard of perfection, has a distinct place. I think anybody in our section is justified in planting not over ten per cent of his orchard in that variety; but I question the wisdom of growing Ben Davis in Maine, where it does not reach maturity, and where you can grow Baldwins to such perfection as I see in those downstairs.

In selecting varieties for the commercial orchard, get those which will give some latitude in harvesting. I do not attempt to grow summer or early fall varieties. I have only late fall and



winter sorts. But being obliged to bring in a picking gang of thirty to fifty men, I want to give them enough work so as to make it an object for them to come to me every year. That is why I have planted along with my winter apples some late fall and early winter sorts, such as the Grimes Golden and the Mother, which can be picked ten or fifteen days before the winter sorts are ready to come off, and will extend my picking season that much. This counts a great deal when we come to the labor problem.

*Planting with Dynamite.* Perhaps some of you have tried the much advertised method of dynamiting in planting the trees. Our conclusions in Virginia have been quite unanimous that it is not expedient or profitable, except on land which has very stiff subsoil or a shale close to the surface, and such lands should not be put in orchard, anyhow. We have listened to a great deal of claptrap about dynamiting apple lands. We have been even advised to dynamite mature, bearing orchards, to set off little blasts of dynamite every forty feet to loosen up the land. This seems to me the most senseless thing that could be recommended. Experiments in New Jersey and Pennsylvania, and in Virginia, have shown that on land properly fitted for apple trees the ordinary digging of a good hole gives just as satisfactory results as dynamiting. If dynamiting at all, it should always be done in the fall so that the loosened soil may fall back into place to some extent before the trees are set in the spring, otherwise the trees may suffer from a spring drought.

*Tillage Problems.* I showed you last night pictures illustrating soil management in the mature orchard. I tried to bring out the fact that there are occasions when clean tillage of the bearing orchard may not be as desirable as keeping it in sod part of the time. My bearing orchard is tilled one year in three. The orchard is plowed or worked with a cut-away harrow in February, and is cultivated three or four times, perhaps until the first of July; then it is seeded to cow peas or soy beans, which make a nice growth before frost. Early the next spring that land is disked and is seeded to red clover in March or April. I have never found any green manuring crop, not excepting crimson clover or hairy vetch, which equals old fashioned clover in soil improving value and general adaptability for the bearing apple orchard. It is clipped two or three times during



the season with the mowing machine, and the clippings mulch the ground. It stands another year, so that the orchard is two years out of three in red clover. It is then plowed and comes into tillage and soy beans again. For mature orchards—not young orchards—on land which is reasonably moist and reasonably strong in fertility, this plan works all right in Virginia. You will have to ask your experts here whether it is practicable in Maine.

A word about the relation of cultivation to certain diseases of apples. We have considerable trouble with the brown spot, or punk spot, as we call it, especially on our Yorks and Jonathans. You have it on Baldwins. There is a distinct relation in Virginia between the prevalence of those diseases and tillage. In those orchards which are cultivated very thoroughly and frequently, so that the trees make a luxuriant growth and heavy leaf surface, as they will under high tillage, invariably, you will find a larger proportion of the apples with the brown spot than in orchards which are but little tilled and which make a somewhat slower growth. On trees which are bearing a light crop, or which have been heavily fertilized so that the growth is luxuriant and the amount of drain per tree by the crop is small, we find the most brown spot. I have come to the conclusion that a slow growth, secured by withholding tillage or fertilizer, and by allowing the trees to set a comparatively heavy crop alternate years, is the most practical way we now know of reducing the amount of brown spot.

*Pruning.* In the pruning of the orchard there are some problems that have a bearing upon the cost of production; particularly, the height of the head. In the valley of Virginia apple trees do not grow as high as they do here. But they can be headed too low. The lower the better so long as it is not too inconvenient in working around them. Nearly every apple orchard has to be either plowed and harrowed or mowed with the mowing machine. Some people, I think, have gone to the extreme in low heading; they have trees headed so low that it is extremely difficult to work around them with the teams. I head a little over two feet high, and after the second year do not cut back at all unless the trees are getting up to about twenty feet in height.

There are some who advise: "Don't touch a tree with a knife any more than is necessary to let in the sun." This does not work with me; I have tried it. If you allow young trees in Virginia to make their natural growth, without cutting them back the first two years, or three, after planting, they become sprawling and straggly; the first heavy crop of fruit bends them down to the ground and splits off the limbs. We are obliged to cut back the trees heavily the first few years in order to strengthen and thicken the trunk and form the head. After the third year the less pruning the better, so only the top is kept open.

Summer pruning, we believe in Virginia, is a special practice for special conditions. This is another illustration of the danger of importing bodily methods that have been found successful in another section, without first determining whether the conditions are the same. On the Pacific coast, particularly in the Puget Sound country where they have a very temperate climate and trees make an extreme vegetative growth, summer pruning is necessary and desirable. They have to check growth in order to get fruit. Summer pruning in Virginia in the same measure would seriously hurt the trees. We use summer pruning chiefly on young trees, six or seven years old, which ought to be coming into bearing, but which have not done so because they are making too much wood. A light pruning in July usually brings these trees into bearing. It is a special practice for certain trees, not a general practice for all trees. Most of our pruning is best done in the spring and during the winter. I start pruning in the fall as soon as the leaves are off and keep at it during the winter, whenever the weather is mild. We have few days when the wood is frozen, so that we can prune all winter without danger of winter injury, which is an advantage in a large orchard.

*Fertilizing.* There are the two opposing camps on the subject of apple fertilizing. There is the report of the New York Experiment Station, showing that in western New York there is no profit in fertilizing apples at all; and there is a report from the Pennsylvania Experiment Station showing marked profit from fertilizing apples. I have found it distinctly profitable to use fertilizers. I do this, however, with the tree as a unit, not the orchard. In other words, instead of applying a thousand

pounds of fertilizer per acre, I apply so many pounds per tree, as the tree seems to need it. If you go through any orchard in the summer time, you will see distinct individuality in trees: some are weak; some are strong; some need help, some do not. I fertilize according to the condition of the tree, as recorded in my orchard book. A tree to tree record in a commercial orchard seems like a pretty big task, yet I believe that until we come to the point where we deal with the individual tree rather than with the orchard as a unit, we shall not realize maximum returns. When the time comes to make my estimate of the coming crop, in August, I go through the orchard with a set of pocket note-books, a page to a tree, on which I have a record of the crop of each tree, as well as its health and vigor, for each of the seven years I have had the orchard. I have to estimate the crop anyhow in order to know how much barrel stock to order, and it is but little more trouble to take this book along and record the condition of the tree with the estimate of the amount of fruit it will bear. If the tree is sub-normal and needs a stimulant, tie a white tag on it. Then when hauling manure to the orchard in the winter, pick out these tagged trees, so as to make the manure go as far as possible.

I always use manure if I can get it; it gives larger returns than any commercial fertilizer I have used. Even when I drive four miles to a livery stable and pay a dollar for a two-horse load, I get more for my dollar than from any fertilizer I have ever used. When the supply of manure fails, I have used one part of nitrate of soda to three parts of acid phosphate. Sometimes I have used one part of potash also, but our soils do not need potash as much as yours do. This fertilizer mixture is applied just after the blossoms drop. Nitrate of soda is quickly soluble and blossoming is an exhaustive process, so we get immediate results if applied at that time.

*Spraying Machinery.* I wish to emphasize again what I said last night about spray machinery. We must revise our estimates as to the ability of a machine to cover trees. Twenty acres of mature trees to one power outfit is plenty. I have been trying to cover forty acres of twenty-year-old trees with one gasoline outfit, and I am satisfied that I have lost the price of three machines, or more, by doing so. It takes about seven

days to cover my orchard thoroughly. In seven days the calyx cups, which are the most feasible point of attacking the codling moth worm, with us, have begun to close. I ought to get that orchard sprayed in five days, and if one machine cannot do it, I ought to get another.

The gasoline outfit has one advantage which makes it superior to the new type of compressed air outfit, which has the compressor and the engine attached on the wagon with the tank. We need the gasoline engines to run our sizing machines. Aside from this the compressed air outfits are excellent. They certainly use somewhat less liquid than the gasoline outfits. They make a mist spray, not a driving spray, and they are simpler and considerably lighter than a gasoline outfit.

*Spraying Treatment.* We heard an excellent discussion this afternoon of the diseases that attack Maine fruit. You may be interested to know what we have to fight in Virginia. On the whole, we have less to contend with in Virginia than you have. I never spray more than four times a season and find that this controls pests reasonably well.

To comfort any who may be alarmed as to the outcome of the San Jose scale in the apple orchards of Maine, let me say, we have the San Jose scale in Virginia, but it is the least of our troubles. Fifteen years ago the apple growers of Virginia were demoralized at the prospect of the scale coming into their orchards. They supposed it would ruin the business. Now it is considered the easiest pest to control of any we have. About one year in three I am obliged to apply the San Jose scale spray, when the trees are dormant. There is always a little scale, just enough to continue the species in the orchard, but not enough to make the fruit unmerchantable. I apply this spray as late as I dare, for two reasons: First, because the scale is more vulnerable then, having passed through the winter, and the shell around the insect has become thin so that it is easier to kill; second, because late dormant spraying kills aphids. When the winter buds are opening, so you can barely see green in the end, the rosy aphid, one of our worst insect pests, has already begun to hatch and we can see the little lice on the cluster buds. By applying the strong dormant spray then, we not only kill the scale but we also control the aphids to a large extent. Of course there is danger that if it turns warm



suddenly the blossoms will come out in a hurry and you will be caught with your dormant spraying unfinished. There is this danger, but I prefer to run the risk and kill the two bugs with one spray.

Question: And you don't get any injury when you delay the dormant spray?

MR. FLETCHER: No, except there are a few buds blasted. When this spray is applied we cannot see the blossom at all; the cluster bud, or winter bud, is barely open, so you can see the tips of the green leaves and possibly the pink of the petals.

Question: What is the strength?

MR. FLETCHER: The regular strength of 1-7, one part of concentrated lime-sulphur solution, testing 32 degrees, to seven of water. The second spraying that I give is right after the petals fall. I have never seen a scab spot in my orchard, even on a Winesap or Ben Davis. Ten miles from me, across the Blue Ridge, they have as much trouble from scab as you do, and have to give one spraying before the blossoms open, while the buds show pink. This shows the utter futility of any man advising another on these matters, unless he knows the conditions. So I omit the pink spray and apply the first spray after the blossoms fall, the second, ten days later, and the third, nine weeks after the blossoms fall, this being for the second brood of codling moth. These three sprays usually give reasonable protection.

*Codling Moth and Rosy Aphis.* Our greatest pest is the codling moth. It fairly makes my heart sick when I go to the cull shed to see the large proportion of apples, otherwise perfect, which the worm has made unmarketable. We not only have two broods there, where you have mostly one—two per cent of your first brood, I understand, goes into a second brood—but also our moths emerge over a longer period, so it is a continual fight between the time the petals fall until the first of August. We are doing pretty well if we can get out with apples 95 per cent free from worms.

We have little trouble with green aphids except on young trees, one to four years set. After trying various ways of spraying, I have adopted the method of dipping the ends of the twigs into a pail of tobacco decoction. The aphids are on the tips of the branches; a man with a bucket of tobacco decoc-



tion—black leaf 40—dips these branches in and there is no trouble that year, as there would be if the tree were simply sprayed, because of the curled leaves. In bearing orchards, I am obliged to spray with black leaf 40, two years out of three. Those years when I do the dormant spraying for scale late in the spring, I rarely have enough aphid to make further treatment necessary. Other years I have to put black leaf 40 into the spray that is applied just after the petals fall. As I have no scab, I do not need to apply the pink spray, which is usually the best place to use the black leaf 40 for aphid. We control the pest well enough by putting it in the codling moth spray, thereby giving a triune spray; the lime-sulphur for cedar rust, the arsenate of lead for codling moth, and the tobacco for aphid, all three in one spray. As far as I can see each is as effective as if applied individually.

Question: Will you please tell us the amount of black leaf 40 for that aphid spray?

MR. FLETCHER: We use half a pint to fifty gallons of spray. Some of our growers are making their own tobacco decoction. Virginia is a tobacco growing state. We can get the stems and refuse very cheaply. By simply soaking the stems over night we can recover a large percentage of the nicotine, varying with the kind of tobacco used. After being soaked the stems still retain practically all their fertilizing value and can be used around the trees. I am very much in hopes that the home preparation of tobacco decoction will reduce the cost of this necessary spray material.

Question: You consider that the best spray to control aphid?

MR. FLETCHER: I know of nothing better.

*Home-made Lime-Sulphur.* I make my concentrated lime-sulphur, and have for four years. I see no reason for paying \$7 to \$8 a barrel when I can make it at home for \$3. I have 40 acres of bearing orchard 25 years old. The cost of the outfit for making this preparation at home was \$50. For \$40 I bought a steam feed cooker, which is a small boiler, about one and one-half horse power. There had to be also some piping connections. This boils 50 gallons of material at a time. I use 100 pounds of commercial sulphur, 50 pounds of quick lime, to make 50 gallons of the concentrated solution. Many of our growers get better results with hydrated lime; it enters into

solution better than quick lime and is less apt to have carbonate of lime in it. If you use hydrated lime, put in 67 pounds instead of 50, since hydrated lime is one-third water. The home-made solution costs me \$3 a barrel and tests an average of 29 degrees; it is diluted in proportion to the ratio it bears to the standard 32 degree commercial solution.

*Bracing limbs.* The limbs of our apple trees are very brittle; they are not as tough as the limbs of your Baldwins. So we resort to wiring them instead of propping. In the center of each tree, about eight feet above the crotch, there is a small iron ring, from which wires radiate in all directions to the main limbs so as to brace one another. The wires are attached to the limbs by screw-eyes. This we have found much better than propping. There is less breakage and it is a permanent improvement. Props rot and break.

*Thinning.* I wish to say a word more about thinning. This is another proposition that has been imported bodily from the west; we have been told that we should thin apples to eight inches apart, as they do in Oregon. I am not sure whether we ought to or not, at least with certain varieties. I have been thinning for five years and have come to the conclusion not to thin the York Imperial again unless the tree is very heavily loaded or is weak. Certain varieties, including the York Imperial, sell better if of medium size rather than large size. If we should thin Yorks to eight inches apart, the distance recommended in the west, they would be over-grown, lop-sided, and speckled with brown spot. If we leave them nearly as they set, almost touching one another, we get good medium two and one-half to three inch fruit, which keeps well and sells well. It is better to get that crop and let the tree rest a year, if necessary, than to thin it every year and get a lot of over-grown, spotted fruit each year.

With the Winesap and some other varieties, thinning pays, if the tree is overloaded. It does not seem to have any effect on the quality of the fruit of these varieties. So, I say, thinning must be done with discrimination, if at all.

We have one advantage in Virginia that is not enjoyed everywhere; our long picking season. We can begin picking near the middle of September and continue until the last of

October or first of November. It may be more practicable to do whatever thinning is necessary the middle of September, rather than in June; in other words, let the fruit hang as thick as it will without breaking the tree, and along in September pick off the outside fruit that is beginning to color and sell it for the export trade, leaving a whole month for the remaining apples to size up and color on the trees. This may be better than to pick off apples in June and drop them on the ground and get nothing for them.

*Harvesting.* Some of our growers have found it best to pay for picking by the piece; the usual price is ten cents a barrel. I do not like this plan. The apples are not picked as carefully and it costs more. This year my pickers averaged twenty-five barrels each a day, yet I was only paying them \$1.50 a day. You can see why I am not enthusiastic about paying by the piece. It is a good plan, however, to have a check system even when paying by the day. As each picker brings in a barrel of apples, give him a check. At the end of the day he returns the checks to the picking foreman, who records in a book the amount of apples each man has picked. This gives a line on whether a picker is a drone or a worker; the drones are eliminated, and there is a standard set which we expect each picker to reach.

This year I used rubber stamps entirely for stencilling the barrels. Tin stencils, as you know, usually get twisted and the letters are broken, resulting in a blurred and unattractive stencil. I had some rubber stamps made, some with five-eighth inch letters, some smaller. One of those stamps would have on it "Virginia" in rubber type, another would have on it "Apples." Having the inked pad before you, you take these two stamps in your hand, put them on the pad, then on the barrel, and your legend is stamped in one-tenth the time it takes with the old tin stencil. I shall never use a tin stencil again; the rubber stamp lasts longer, costs no more, and saves time.

*Selling Apples.* Some of our growers sell "on the trees." The speculator goes through the orchard and says, "I will give you so much for the apples just as they hang on the trees." Likely as not that is in August, possibly July, long before the apples are ripe. That is speculation; it is not apple selling. The buyer knows how to estimate a crop of apples on the trees

better than the grower; the grower only estimates his own orchard, while the buyer estimates hundreds of them everywhere. It is his business; he is more keen at it. Nine times out of ten the orchard packs out many more barrels of apples than the grower had estimated. Of course the buyer has to take the chance of hail, windstorms, disease and other mishaps between the time he buys them and when they are ready to be picked, and he makes big allowances for that in his price. Selling on the trees, while it relieves the grower of a lot of work, is a very unsatisfactory way of marketing apples; nine times out of ten the grower does not get full value for his crop.

Selling to a buyer f. o. b. shipping point is much better. The disadvantage is that the grower often sells to a different buyer every year and so does not acquire a reputation for his pack. One crop does not help to sell another. This is one of the great advantages of a coöperative selling organization.

Consignment gives good results if you get in touch with a good commission man and stay with him year after year. Most of us do not do this. We sell to the apple speculator when prices are good and buyers numerous, but the next year—as in 1914, when few buyers were around—we consign, because we have no other way of handling it, and we get poor returns. I have sold apples in all these ways; but the nearer I can come to f. o. b. business the better off I am. I find it best to take a fair price for apples in the fall at the packing shed rather than to put them in storage or consign. The storage and selling of apples is a business by itself, wholly apart and separate from the business of growing apples. It is a field in which I confess I have no ability myself, and I am willing to turn that whole matter over to those who know how to do it. I would rather take a smaller f. o. b. price in the fall than to take the chance of getting a little more for them out of storage or from consignment. Sell as soon as you can get a fair price, then start to raising next year's crop, is the way I feel about it.

As I told you last night, the cost of production with me has run about \$1.15 a barrel. This is based on seven years' work. You cannot get at the cost of producing apples from the returns of one, two, or three years. My average net returns for seven years have been \$2.65. This may not seem large to you, but remember that we are growing apples on a large scale for



wholesale market, not retail. This is a fair return on the investment.

It seems to me that the outlook for apple growing in Virginia, as in Maine, is bright. The boom days are over. We are not going to hear many more reports of apple orchards selling for \$1000 an acre. We must expect years of low prices, like 1914, every now and then. But the man who uses judgment in selecting a location and in the care of the orchard and who stays with it year after year should not have cause to regret his choice of business.

MR. SANDERS: In regard to the cost of heating orchards, I happened to make the statement incidentally, that the cost of heating orchards down in Nova Scotia—what was it you put your cost at, heating the orchards, per acre?

MR. FLETCHER: My understanding is that the cost of equipping an orchard with the type of heaters that are recommended today in the west, together with oil reservoirs, oil and labor, ordinarily would average about \$50 an acre.

MR. SANDERS: I would not like my statement to go alongside of this without some explanation of my end of it. In Nova Scotia we get a tin heater for eleven cents each, which holds about two gallons, we put in one and one-half gallons of crude oil, costing six cents a gallon, using 35 to the acre. The labor we estimate about \$2 an acre. In that way we get the cost of heating down to the price I mentioned, \$5.50 an acre.

MR. FLETCHER: What result did you get from it?

MR. SANDERS: With 50 heaters to the acre we raised the temperature nine degrees. With 35 to the acre, we raised it from 29 to 34.

MR. FLETCHER: Fifty dollars an acre is the ordinary estimate in the west, to which I referred.

#### QUESTION BOX.

No. 46. Does it pay to pinch back the new growth of red raspberries in the summer? .

PRESIDENT CONANT: I will say just a word on this subject, hoping somebody will volunteer some further information. I attempt to grow some small fruits. It seems that there are two systems of growing the red raspberry; one is called the straight cane and the other the lateral. Now, as I understand



it, the pinching back of the new growth in the summer has a tendency to force laterals and in that way you get your lateral cane. Otherwise you would have the straight cane, to be headed back the following spring—which would naturally winter-kill a little and have to be cut back the following spring. My experience has been this, that whenever you pinch back a cane in the summer you force out this lateral growth, large lateral growth, which does not become ripened sufficiently, so but that we get a tremendous amount of winter injury. Ninety per cent of my canes producing laterals are ruined by winter injury every year, or have been for the last five years. So I practice the straight cane system, and in this way I have had very little trouble with winter injury of the red raspberry. I grow only the Cuthbert variety.

Has any other grower present had any experience along this line? If you have, please volunteer to give your experience.

Question: We have about an acre and a half of red raspberries and purple ones, which we put between the plum trees—can't cultivate them very much, and so we grow those in the line of the fruit trees—large trees. Last winter the raspberries winter-killed very badly. The red ones died back almost completely; injured them quite a good deal. Now, what I want to find out is whether it would do to prune those in the fall, or wait till spring? Which would be the best way?

MR. McALLISTER: Mr. President, I would like to ask the gentleman a question. What is your system of fertilizing?

Answer: Barn manure.

MR. McALLISTER: What time do you put it on?

Answer: We put it on in the spring, generally, though this year we started a new idea which we got up ourselves. We took about one-third part of our raspberry patch and put a fence of hen wire around it, and put our hens in there.

MR. CONANT: In reply to what this gentleman has said, with my experience, I would say this: Quite a number of small fruit growers have come to me this present summer and fall and asked me, "What success did you have with your raspberries this year?" My reply was that it was the only normal crop I produced on the farm. And inquiring of them what success they had had, in nearly every case winter injuries—winter-killing. My next question was, "What is your method

of fertilization?" Barn dressing too late, late cultivation in the fall, and the canes were very vigorous and did not get ripened. Now, it seems to me, and my experience bears out this line, the only successful way to produce red raspberries is to fertilize with chemicals, using for your source of nitrogen, nitrate of soda almost wholly, and that applied early in the spring will become available before the middle of the summer, allowing the fall to harden and ripen your canes. For six years I have never lost any raspberry canes. I would not consider it, under my conditions, a safe proposition at all to use barn dressing or hen dressing or anything like that, where there is an excessive amount of nitrogen or ammonia to continue this growth. The canes must stop growing early in the fall and harden and ripen in good firm shape if you expect to get by in our cold winters. That is my idea after six or seven years' experience in growing raspberries.

MR. WYMAN: That is why I asked that question about cutting back. I think there is not any trouble about raspberries winter-killing (I have raised them for twenty years) if they are laid down in the fall. It is inconvenient to lay them down if they are not cut back so as to shorten the growth. Now, in regard to the fertilizer, I never would use barn manure on a bearing plantation. I want barn manure to grow the plants, and then after they come into bearing, use commercial fertilizer, and the best commercial fertilizer I have found was 400 pounds nitrate of soda, 400 pounds ground bone, 400 pounds muriate of potash, 800 pounds acid phosphate. That has given the best results.

MR. CONANT: I think this matter of fertilizing the canes, doing it early in the spring and maturing the canes, is the only safeguard against winter injury in 95 cases out of 100. Last season was a very hard season for small fruits.

Question: Do I understand you do not recommend hen manure for raspberries?

Answer: I would not do it—not for bearing canes.

Question: I have a friend with seven or eight acres, in New Bedford, Massachusetts, who has used that method altogether. He has had wonderful success.

MR. CONANT: That is under entirely different conditions. My idea of growing raspberries is to produce them at the lowest

possible cost, as was said about the barrel of apples. Mr. Wyman buries his canes. I do not believe I can afford the time and the effort to cover the tops of the canes, and under my system of growing it is not necessary to do so.

No. 74. Name the best commercial varieties of (a) red raspberries; (b) black raspberries; (c) purple raspberries; (d) blackberries.

MR. CONANT: I am hardly able to answer that, although I have looked into the matter somewhat in regard to what were the most prolific and hardy varieties, and I find among growers throughout New England that the Herbert and the Cuthbert are the prevailing commercial varieties of red raspberries, the Herbert being perhaps a little hardier plant, but not so large a yielder as the Cuthbert.

No. 63. Should strawberries be set on fresh sod land?

MR. WYMAN: If you want them destroyed by white grub, set them on sod land.

No. 64. What is the best method of preparing the soil for strawberries?

MR. WYMAN: I would prefer a soil in the first place that has been planted the year before and cultivated, and then plow it in the fall and also in the spring, and have it well harrowed.

Question: I would like to ask one question in regard to strawberry growing. I am able to get a very good stand of plants in the matted row system and now I want to know the best method of fertilizing those strawberries. Should I put it on this fall, or wait till spring, and what should I put on? I want to get big berries. I have always been trying to get large berries. I do not succeed in getting the very largest ones. I have a very good stand.

MR. CONANT: Mr. Wyman, will you give the gentlemen your experience in fertilizing and managing a strawberry bed?

MR. WYMAN: My idea would be to use barn dressing, if you use it in the fall. I do not like barn dressing used in the spring. And then, the year that the plants are in bearing, use commercial fertilizer, if any.

MR. CONANT: Would you use nitrate of soda for your nitrogen?

MR. WYMAN: Yes.

No. 39. Should lime be used in the orchard?

MR. CONANT: Now, this may not seem an important question, but it is an important question, and I am glad the brother has asked this question. I will just give all the information I know about it, and then I want to throw it open. I put but very little lime in my orchard, but I have watched and read a great deal about liming the orchard. I listened, when in Connecticut last winter, to a talk by Dr. Wheeler who is considered an authority on lime and liming, and this question was asked of Dr. Wheeler. Should lime be used in the orchard, and how much?—something like that. And his reply came very readily, "Very little." Now, it seemed that he had been carrying on experiments along this very line, and he finds that in a majority of cases it is detrimental to the trees; that an orchard will thrive and do better under perhaps a slightly acid condition than it will with too much lime correcting the acidity, and he advised the growers to be very careful in applying lime in the orchard. There might be extreme cases where it would be advisable to lime the orchard, but to go very carefully, not putting too much lime in the orchard until he knew just what the condition was. This is a very important question. I would like to hear from others. I would like to have volunteer information from the various growers present. I am going to call on Mr. Keyser.

MR. KEYSER: I have not used lime direct. Where we use barnyard dressing in the orchard, we use, later in the season, basic slag, 500 pounds to the acre. That is our extent on the lime question. We use it with the idea of giving a balance to the dressing. But of course we all know that raising fruit with us on barnyard dressing, continually, more than once in three or four years, we cannot get colored fruit.

MR. FLETCHER: I think that the experiments that have been made on the use of lime for fruit trees, have shown conclusively that they do not need lime as do many crops. On the other hand, we must remember that a large body of the most successful commercial orchards in the country are in that great limestone belt stretching from Pennsylvania, western New York, down to Virginia and southerly, so that the apple tree is certainly tolerant of lime when present in its natural home. We must also remember that we cannot get a good stand, a good growth of the leguminous crops, especially red clover and crimson clover, unless there is a reasonable amount of lime in the



soil, and, in these cases where lime is insufficient in the soil, it is a practice in Virginia to lime, specially, using the carbonate lime, sufficiently to make the soil sweet enough for the growth of legumes. We must have leguminous cover crops in the orchard and one is justified in liming sufficiently to get them, even though it may not be needed for the apple trees.

No. 41. Are bees necessary for largest yield of blossom crops?

Answer: I don't keep bees now. I have in years past, and I think they are a very essential thing to have on a fruit farm, for I know that when I had two or three swarms of bees we got more raspberries, and I think better raspberries, and I know well enough I got more apples than I do now. So I should say that bees would be profitable on a fruit farm.

MR. CONANT: I have heard this question brought up in several meetings. It seems about evenly divided. Some think it makes a very little difference whether bees are kept on the farm or not. Personally, I am not in a position to give any information on the subject, though I keep some bees, and I know that on the red raspberries and the fruit trees I get a very good set of fruit.

MR. WYMAN: I think, Mr. President, that it is profitable to have bees for the honey we get and also for the benefit they are to the berries. I know of a row of raspberries, less than ten rods long, where I counted 150 honey-bees on one side. I think they do some good.

DR. FLETCHER: I think it is known beyond any doubt that the pollen of the apple is not carried to any extent by the wind. It is only carried by insects. I am thoroughly satisfied in my own orchard, in which I have observed carefully, that it pays me each year to put, as I do, five or six colonies of bees in the middle of the orchard through the blossoming season. I usually lose at least half of these bees by poison in the blossoms. Ninety per cent of the blossoms drop off and I have to give a spraying while there are some belated blossoms on the trees, to which the bees come and get the poison which I have applied. I lose those bees. But I am satisfied I gain ten times over in the increased set of fruit, resulting from their effort.

No. 18. What are we going to use for fertilizers in our orchards the coming season?



MR. CONANT: This is a very timely question. It is a question many of us will not be able to settle at this time. However, I would like to hear from the various growers on this subject. Personally, I feel like this: We have had a wet season. Our trees are in splendid vigorous condition; they set heavily with fruit buds, made splendid growth and are in fine condition. In my particular case, knowing the conditions and methods of feeding, the practice in the past, I shall be very careful not to overfeed my trees this year. Consequently, I will probably reduce the amount per acre of fertilizer.

MR. MORSE: I think this is quite a question. We are planning to use barn dressing, as far as possible, instead of chemicals. We have been using chemical fertilizers, perhaps longer than any other orchardist in the state—fifteen years at least—and we have found that our trees do not seem to respond to its use as they did formerly. So far as the chemical is concerned we must wait and see what we can get.

No. 42. Is bird life to be encouraged by the grower of small fruits?

MR. WYMAN: I think, Mr. President, it should be encouraged by all means. They destroy lots of insects among our small fruits as well as the large fruits.

MR. CONANT: I am of the same opinion as Mr. Wyman. While they destroy more or less fruit, cherries and things like that, I think they do us a great deal more good than harm. I shall certainly do my best to increase the number of birds on my farm.

No. 49. What is an average yield per acre for red raspberries?

MR. WYMAN: I have been averaging mine, Mr. President, as near as I can get at it for a series of years. I find it is about 40 bushels to the acre.

Question: How many years?

MR. WYMAN: Well, I have gone back five years.

MR. CONANT: I have asked that question of large growers in Massachusetts and Connecticut, and they say from 1800 to 2000 quarts per acre. And I will say that is practically what my acre yields.

Question: What is the average price?

MR. CONANT: I am not in a position to give you those figures. We have the figures—the cost of harvesting the berries and

what they brought, but we have not had time to figure to get the average net price per basket. It will probably be between nine and twelve cents a quart, against former years right round fourteen to fifteen. This has been a very hard year in Maine. The rainy season was on right at the picking time and berries would not stand up to ship, as they have in previous years, or as they normally do, consequently, did not bring the price in the markets that they otherwise would have. I think one of our largest growers in the state shipped half a car from our county, into perhaps this market here, and they were moldy when they arrived. You could not ship them any distance this year and have them reach the market looking fresh.

MR. —————: We have had the same experience with mold. We shipped some to Jackson, N. H. When they arrived there they said they were quite moldy. But we shipped some to Fryeburg and they arrived in good shape and it was not so far to go. We sold them by the crate—12½ cents a quart box.

MR. CONANT: It certainly was a hard year to handle red raspberries, because it rained nearly every day through the picking season and the berries were water-logged and soft and would not keep any length of time.

## COOPERATIVE MARKETING OF FARM PRODUCTS.

C. E. BASSETT, Office of Markets, United States Department of Agriculture.

Farming is something more than the mere producing of agricultural products, and to be successful, requires as much capacity and as much judgment as any commercial or industrial pursuit. Therefore, it should be not only an occupation but a business.

Heretofore, the farmer has almost entirely disregarded those things relating to the business end of his work, depending to a great extent upon his banker and the wholesale handlers of farm products. Numerous agencies have done excellent work in placing farming upon a scientific basis, especially that which has been accomplished by the state agricultural colleges and experiment stations and the United States Department of Agriculture toward increasing the production of agricultural products and making farm life better. However, we have now

reached a point where farming must be placed upon a business as well as a scientific footing. The problem confronting us today is not so much that of increasing our production as that we shall be able to dispose of that which we do produce at an equitable price. Both producer and consumer are complaining; the consumer, that he pays too much for that which comes to his table and the producer, that he is not receiving a fair price for that which he produces.

#### PRODUCTION IS ONLY HALF.

When a farmer has raised his crop he has accomplished but half his work; the other half, that of selling, determines his year's profits; and here in the marketing he comes face to face with his greatest problem.

The largest cotton crop, the largest corn crop in the history of our nation, have yielded the producers of these crops a less amount of profit than has been obtained in certain years of less production. Also during these years of heavy yield the prices paid by the consumers in most sections have not reflected in a proper degree the low prices paid to the farmers.

#### FAULTY DISTRIBUTION.

To the careful observer it is evident that there is a lack of an efficient system of distribution and marketing of agricultural products. While one market suffers from congestion caused by an oversupply, another may be suffering from a dearth, and at the same time tons of food products may be wasting in fields and orchards for want of a profitable market. It is a most common occurrence for one market to be glutted with a product while in another there is a scarcity—this condition applying particularly to highly perishable products which can not be placed in storage and held until there is a demand, nor shipped to some distant city where there is a market. Hence it is that we yearly have thousands of cars of agricultural products shipped into markets only to rot or be dumped, owing to the glutted condition at the time they are received. The remedy for this is a more equitable distribution.

As an example of our clumsy, inefficient method of distribution, the following example is cited: Steers raised in California

by an Oregon operator have been shipped through Denver to Omaha and their beef sent to points on the Atlantic Coast, while Oregon and California points were importing beef from Chicago. Hogs raised in Illinois and sold at Indianapolis have been slaughtered in Boston and a part of their cured bacon shipped to Los Angeles, while Oregon hogs were being shipped to Omaha. Michigan dressed veal calves, *expressed* to South Water Street Commission Houses at Chicago, have been returned to the *identical* shipping points from which they came to fill orders from local retail meat markets.

#### INTERMEDIARY EXPENSES.

Some attribute our marketing difficulties to the presence of so many middle-men and speculators. These agencies have come into existence by the failure or inability of the farmer to perform these duties himself. If he is unable to personally distribute his crops and deal direct with the consumer or warehouse these crops until the market is ready to consume them, he must employ agents or commission men to do this work for him. It is no doubt true, however, that there are entirely too many middle-men engaged in the distribution of agricultural products. Under our present system of marketing some of these intermediary agents are a necessity, but a great number are a burden to both producer and consumer.

#### MARKETING DIFFERS FROM PRODUCTION.

The individual grower of agricultural products cannot stand on equal ground with the buyers of his products, in that he does not have the knowledge of market and crop conditions, nor selling experience sufficient to hold his own in striking a bargain. Production and marketing are essentially different and special ability is required to do either well. This is an age of specialization. All large commercial and industrial enterprises are divided into departments managed by experts in their given lines. The sales departments have their sales agents who have spent years in study in order to become expert salesmen; purchasing departments have their expert buyers, while the factory or producing end has another corps of experts.

The necessity of separating the producing force from the selling force has been realized by manufacturing concerns. Why

is it not necessary to separate the producing from the selling force in agriculture? The farmer is a specialist in production and generally not skilled in marketing.

#### COÖPERATIVE PLAN.

A new faith has developed on the part of the American farmer, that the coöperative plan of doing farm business is the most satisfactory method. In fact, the American farmer is being driven to coöperation by necessity. While we hear considerable of the extent to which coöperation in the marketing of agricultural products has been carried on in foreign countries, such as Belgium, Germany, Ireland, Denmark and others, from investigations which have been carried on by the Office of Markets and rural Organization, it has been found that there are over 8,000 organizations in this country which are coöperative or owned by producers engaged in the marketing of agricultural products and in the purchasing of farm supplies. Over a billion dollars' worth of products will be marketed by these organizations this year. From this it will be seen that American farmers are beginning to realize that by selling coöperatively they will not only be able to offer a standardized product and reduce the cost of marketing, but they will be able to furnish this better article to the consumer at the same, or even at a lower price, thus stimulating consumption. In fact, any system of marketing that does not give better service or better prices to the consumer and at the same time secure for the producer a greater net return, is founded on improper principles.

#### WORK OF AN ORGANIZATION.

Coöperation in the marketing of agricultural products include the establishment of grades and standards and, where possible, the adoption of brands and trade marks, the securing of capital and credit, proper advertising to encourage consumption of the meritorious but little known product, discovery of new and extension of old markets, securing information as to crop and marketing conditions, the equitable division of profits, adapting production to meet market requirements and the utilization of by-products, securing cold and common storage facilities, the



coöperative buying and manufacturing of supplies, securing of lower freight rates, more equitable refrigeration charges and more efficient transportation service, the securing of more and better labor and the general cultivation of a spirit of coöperation and uplift in all community affairs. Strange as it may seem, there are many who prefer to ship their products to a distant market, of which they know practically nothing, to be handled by some firm of whom they know less, rather than to have their property marketed by a competent manager of their own selection. Farming communities coöperate to secure better churches, better local government and better schools. If they are willing to leave their religion, their politics and the education of their children to coöperation, there certainly should be no hesitation in leaving the marketing of their farm crops to a coöperative system that has passed the experimental stage. Coöperation is the act of working with others for the common benefit. This means that all must work and all should share in the benefits in proportion to the support given by each to the enterprise. In coöperative purchasing and marketing associations a certain amount of capital may be necessary and those who furnish it must be paid for its use. Since the profits of the business come from the patronage, either on goods bought or sold or services rendered, they should be divided on this basis rather than on the amount of capital invested. In this respect coöperative organizations differ from ordinary business corporations, which are formed for the purpose of making as great a money return as possible on the capital invested. As in the nation, each citizen is entitled to one vote, so in a coöperative association members usually stand on a voting equality, each member having an equal voice in the affairs of the organization. This prevents control by a few individuals. Members should be bona fide producers. The development of the enterprise should come from within as a natural growth and the professional promoter should be scanned with caution. At the outset small local organizations are safest, but these in turn should federate for greater efficiency. Examples of successful federation are found in the fruit associations of the Pacific north west and California, where as many as 120 small local associations are federated into district exchanges, they in turn being affiliated with a large central selling agency. The first farmers'

coöperative elevator was not formed until the old line companies, aided by the railroads, had driven the prices of grain to such a point that farmers were receiving prices fixed and controlled by a set of interests which were driving the producers of grain out of business. It was out of desperation that the coöperative movement was started, which has grown until now we have over 2,500 farmers and coöperative elevators in this country.

#### NECESSITY.

The producers of perishables that are grown a great distance from consuming markets were driven to coöperation by necessity. The perishable nature of their products and the heavy transportation expense have compelled them to organize and stay organized in order to distribute and market their products in competition with points nearer the consuming centers. Such a condition as this accounts for the highly efficient organizations found in the Pacific northwest and California.

A study of coöperation in this country brings us to the conclusion that coöperation as applied to the distribution and marketing of farm products is not successful, as a rule, unless it is founded upon dire necessity. So long as farmers do fairly well in their own way they are not inclined to coöperate.

That section which makes a specialty of some one phase of agriculture offers the most promising field for coöperation as it gives the association the advantage of a large amount of one product, such as coöperative elevators for handling grain, live-stock shipping associations, meat packing houses, coöperative creameries and cheese factories, egg circles, cotton gins, cotton warehouses, fruit and produce associations, and various others.

One of the most difficult problems in marketing is to build up the trade in a little of about everything that is raised on the general farm and maturing in small quantities at different times. Coöperation therefore is more successful when adapted to the marketing of highly specialized and localized crops.

#### INCORPORATION.

In organizing an association the basic principles as enumerated above should be embodied and the association should be incorporated under the laws of the state in which it will operate.

Some states have a law that fosters coöperation in that it is possible to organize a nonprofit business enterprise under a special coöperative law, while in others it is necessary for the association to be chartered under the regular state corporation law in which case considerable difficulty is experienced in conducting the business on strictly coöperative lines. Various states, however, are realizing the necessity for a law which will allow the formation of farmers' organizations along strict coöperative lines and each year sees the passage of new laws permitting the formation of these organizations. By being chartered under the state laws members and the association are protected by limiting their respective powers, duties and responsibilities.

The plan of operation must be suited to the local conditions and the mere fact that a certain plan has been successfully applied in one section does not warrant the conclusion that it can be copied for some other, as the conditions may be entirely different. It is far more practicable to mold the organization to fit the circumstances. The products to be handled, the location of markets, the functions to be performed, and the character of the farmers to be organized, are important determining factors that must have serious consideration in the plans adopted.

#### CAPABLE MANAGEMENT.

One of the most important essentials for success is capable management. The man placed in charge of a coöperative organization should not only have had experience, but he must be intelligent, diligent and of good judgment, with tact and ability for keeping alive the enthusiasm, interest and coöperation of the members. Inefficient management has been responsible for a great many of the failures of coöperative organizations. The manager should be employed by the board of directors and should have power to employ and discharge labor and secure information as to crop and market conditions, furnishing the same to the members upon request. He should encourage production of the best varieties of products demanded by the trade and aid the growers in every way possible, bringing up the standard of their products to the highest point. He should enter in to contracts for the sale of all association goods and should have entire charge of the marketing of the same, sub-

ject only to the action of the board of directors, by-laws and rules of the association. Expenses of operating the association may be met by a percentage on returns for produce sold or by a fixed price per package, the amount of such charge to be fixed by the directors.

#### COÖPERATIVE PURCHASING.

While many large organizations furnish supplies to members on credit, with ample security, in most cases the merchandise purchased by the association for the use of its members should be paid for in cash in advance or on delivery. Any system of extending unprotected credit requires large capital and often results in considerable loss. Western organizations, however, have built up a system of furnishing supplies to growers throughout the season, these being paid for from the returns of the growers' products shipped through the association. Some fruit associations have carried this financing of the growers one step further and made liberal advances for protective purposes such as labor, water rents, taxes, etc. In these cases crop mortgages are given by the grower to the association as security for such advances. An organization to allow credit to members and not sustain considerable loss should be in a position to collect all accounts due. New associations will make a great mistake in allowing liberal credit. Good security should always be held by the organization for all advances made to growers.

#### MEMBERSHIP AGREEMENT.

A farmers' organization must of necessity be conducted strictly upon business lines. This requires an agreement setting forth the relationship between the member and the association. Without such an agreement an organization lacks stability and rarely succeeds. This is sometimes provided by the signature to by-laws or a contract between the members or by a written contract between each member and the organization. According to law, each member must reserve to himself the right to fix the selling price of his own products, though he may not exercise that right, as a matter of fact.

Farm products should be graded in accordance with specified standards, established by the association, and an effort should be



made to secure greater uniformity in quality and to provide for the enforcement of standards that will furnish a common language between consumer and producer and thus tend to place farm products upon a stable basis in the markets. This applies particularly to perishables. It is essential that the purchaser of a given product may know within reasonable limits what the seller proposes to deliver at a given price and it is impossible to rationally fix prices without such knowledge.

#### GRADING AND PACKING.

It has been stated that farmers as a class are not competent to pack their own products. As a rule they have neither the facilities nor the time to prepare their products properly for market and the conclusion is that coöperation is necessary to bring to uniformity any grade and pack. Certainly such uniformity is exceedingly necessary for successful coöperation. The security of a uniform grade and pack by a coöperative organization requires a good system of inspection.

#### BONDING AND AUDITING.

As a matter of protection and to hold the confidence of the members, it is essential the officers and other employees handling organization funds be bonded and that proper systems of accounting records be kept and frequent audits by competent outside parties be made.

#### DIVISION OF PROFITS.

Of the profits made from the year's operation of a coöperative organization, stockholders, in case the organization is founded upon a stock basis, should receive the local rate of interest on the par value of their stock. Part of the balance should be set aside as a surplus fund to increase the working capital or to finance further improvements. The remaining amounts should be divided among the members in proportion to the value of their shipments and purchases made through the association during the year. There should be some provision whereby any member who has failed during the season to live up to his agreement, by not shipping exclusively through the association or by any other breach of his contract, and provided



further that this failure has resulted in a loss or damage to the association; then the defaulting member should forfeit to the organization such a sum as would reimburse the association for the loss or damages thus sustained. Some form of a binding contract is essential to hold the members of the association together. Many an organization has failed because members were only bound by a gentleman's agreement. Such a membership is totally inadequate for a stable and long-enduring organization.

#### POOLING.

Thorough-going agricultural coöperation naturally suggests the pooling of interests. Growers who ship like grades of the same products during a given time, should receive like returns as a matter of justice, although the shipments of one may have sold at a high price because of the good fortune of arriving at a good market, whereas the shipment of another may have suffered great loss from conditions over which the grower and organization had no control. Pooling of interests practically eliminates the element of chance in so far as the individual is concerned and tends to secure the satisfaction of all. However, without uniform grades, it is not just to pool shipments.

#### UTILIZATION OF BY-PRODUCTS.

It should be the purpose of a coöperative marketing organization to work out all possible economics in the industry of which it is a part. This suggests the utilization of by-products. Under the very best agricultural methods there is always a percentage of the crop that will not grade sufficiently high to justify shipment. The cotton seed industry is founded upon a by-product. The preservation of dropped and culled fruits has come to be an industry within itself. The savings to the farmers from canneries, meat packing houses, preserving houses, pickling factories and cider mills, is very great, but considering the fact that in a recent year, according to estimates, 100,000 carloads of agricultural products went to waste in the United States, the conclusion is inevitable that the utilization of by-products of the farm has been accomplished to an exceedingly limited extent.

## COÖPERATION OF MEMBERS.

Of all things necessary to the success of a coöperative enterprise, the coöperation of the members is the most essential. A disloyal member is the chief element of failure in coöperative circles. The most capable officers, managers and agents cannot be expected to succeed in handling the affairs of organizations unless they receive the full strength of the members' patronage and their complete moral support.

## OUTSIDE INTERFERENCE.

As soon as a coöperative organization is formed, individuals who have formerly reaped the benefits from the farmers' trade, such as outside buyers and occasionally local dealers where supplies have been purchased, will often do everything possible to disrupt the organization. Higher prices than it is possible for the association to obtain for commodities will be offered the producer in the hope that he will accept them, thus drawing his support from the association. It is necessary for the members of the organization to unite with the determination to put forth every effort to make it a success and loyally support it against all outside influence.

Coöperation as an economic principle is receiving the serious consideration of practically all industrial classes. Its application to special features of agricultural distribution and marketing is entirely feasible and offers a solution of problems and difficulties that are practically hopeless in so far as the individual is concerned.

Coöperative marketing is a business enterprise and its success depends upon the loyal support at all times of the members and the efficiency of the management. The reputation of an association for furnishing goods of a dependable quality will establish a trade confidence which is its greatest asset.

Where the producers of a community possess that neighborly feeling which makes each willing to "give and take" a little, for the good of all, there is the spot where the true spirit of coöperation has already found a home and where its people may hope to develop a successful community coöperative business association.

## COST OF AN APPLE.

DR. G. M. TWITCHELL, Monmouth.

*Mr. President:* It is said that the average New England farmer would rather lose one dollar than see his neighbor win two. Whether or not that is true, I wish that every farmer in the State of Maine, every producer of apples and other farm products for the markets, might have heard the clear, terse, straightforward statements made by the speaker this morning. Because it seems to me he has touched the very heart of the problem which we are working over in this state and trying to solve or to approach a solution.

The farmers of the State of Maine and of New England have been having a hard time this year and they are not, perhaps, in just the frame of mind to listen to a discussion of questions as they might be under more favorable circumstances. It seems to me that they are somewhat in the position of the little boy in school when the teacher called out the class and said, "Now, children, I want each one of you to tell me what you have to thank God for." Commencing at the head, the first boy thanked him for a good father, the next one for a good mother, another for his sisters and brothers, finally coming to the foot of the class where there stood a little boy who was all twisted and deformed, cross-eyed, hook-nosed, etc. "Jim, what have you got to thank God for?" He hesitated a moment and then he said, "I don't know as I have got anything to thank God for. He has just about ruined me."

I don't know as the farmers have very much to be thankful for today, in view of the crop conditions which we have been meeting. Yet, as I go about among them, I hear no complaints. If any other industry, any other class had met what the farmers have met this year, there would have been an extra session of the legislature called for state aid before this time. Go where you will. you hear no complaints, just that sturdy holding on in faith, believing that next year things are coming better.

How are we to determine the worth of an apple tree? Mr. Bassett has covered that question along the line that I want to discuss for a few moments. I ask the manufacturer of shoes in the city of Auburn what it costs to produce a pair of shoes and he tells me. I say, "Do you know that is correct?" and he says,

"Why, I have to know. The margin of profit is so small that in no other way could we conduct our business. I must know to a nicety." I ask the agent of a cotton mill what it costs to produce a yard of cotton cloth, and if he knows what it costs. He says, "Certainly, I have to know what it costs, when the profits are so far down in the fraction of a mill in a given yard that the slightest mistake on my part would cause loss and I would lose my job. We must pay our expenses. We must have dividends for our stockholders, and, therefore, I must know what it costs me to produce."

Mr. Bassett said that good business necessitates that condition, and that applies as well to the farmer as to the manufacturer. Are we ready to accept his statement, friends? Do we believe that the same business relation, which governs in other lines of industry, holds with the farm? Unless we do, it seems to me that it is folly for us to discuss the question of the cost of an apple. Because one thing is true, the same business law which governs in the mill or factory governs upon the farm, or else there must be a law peculiar to agriculture, as rigid, as exacting, which we must seek and find the application of. Accept one or the other, we must. I believe that it is the same general law, and that for us to find success in our work we must first determine the cost of production of the products we are getting.

I have been trying to solve that problem for myself for a series of years. There are things necessary for us to see—things that we have not been seeing in the past. It is necessary to take account of items which we have not previously been figuring. I have been asking farmers, for years, as to the cost of producing a barrel of apples. The answer has been invariably, "It costs me fifty cents." The boom days have gone in orcharding. So much we have to be thankful for. We have settled down to business. No longer are men going out and buying what they term deserted, neglected farms, and planting great orchard propositions, and then going back to their city homes and expecting to reap a harvest therefrom.

Some of you know that for the past eight years I have been upon a small piece of land, with a few trees, having a good time, enjoying myself as I never did before, finding a life that I never dared dream possible, and I have also been trying to solve the cost, in the various experiments I have been carrying forward,



in the work I have been trying to do. I have been trying to find what each department costs, keeping an itemized account of everything I am doing and charging up everything at prices which I have to pay for work. If I work with a man a day I charge the same as I pay the man. Everything that I have been doing has been figured on the basis of \$2 a day for a man and \$1 for a horse.

Starting with that little proposition in 1908, with a lot of old neglected trees, in bad shape, as some of you know, I began the work of reconstruction. Pruning the first year consisted in cutting the dead wood, water shoots and suckers and digging out the borers. Twice a year, about June 15 to 20 and August 15 to 20, a man goes over those trees with a magnifying glass and looks carefully and thoroughly for the borers. I find it profitable to make that second trip, because then the borers have hatched and are about one-sixteenth of an inch long and have just commenced working into the outer bark, so they are easily gotten out. Those that are left, if any escape, are gotten out the next spring, in June, when one will find their chips. In that way we practically cleared those trees of that pest. It cost me 29 cents that year. I used ten pounds of Fisher formula fertilizer per tree, at a cost of 26 cents, and cut the grass under the trees at a cost of three cents. In 1909, the pruning was more thorough and cost me 30 cents; fertilizer, 25 cents; sprayed once at a cost of four cents; cutting grass, three cents; total, 62 cents. In 1910, pruning, ten cents; fertilizer, 17 cents—I changed to a formula made of chemicals carrying four and one-half per cent nitrogen, eight-ninths phosphoric acid, seven and one-half potash—ten pounds to the tree; cutting grass, three cents. That year I sprayed the trees and washed them with a lime wash, 17 cents; sprayed twice, 12 cents; and the cost for the year was 59 cents. In 1911, pruning and digging borers, ten cents; fertilizing, 17 cents; spraying three times, 17 cents; cutting grass, three cents; total, 47 cents. In 1912, pruning and digging borers, 12 cents; fertilizing, 19 cents—I increased to 12 pounds that year, per tree; spraying, 17 cents; cutting grass, three cents; total, 51 cents. In 1913, digging borers and pruning was but seven cents; fertilizer, 20 cents; spraying three



times,  $19\frac{1}{2}$  cents—that year I used, in addition to my regular spray solution, Black Leaf 40 for the aphid; cutting grass, three cents; total,  $49\frac{1}{2}$  cents. In 1914, pruning and digging borers, seven cents; fertilizing, 20 cents; spraying three times, 19 cents; cutting grass, three cents. Under part of these trees I mulched with a second crop. I could not sell, and have charged here just the labor, ten cents; total, 59 cents. This year, pruning and digging borers, nine cents; fertilizing, 19 cents; spraying,  $20\frac{1}{2}$  cents; cutting grass, two cents; ten cents for labor in mulching again this year with the second crop; total,  $60\frac{1}{2}$  cents. This is an average for eight years of  $55\frac{1}{4}$  cents, counting every item of cost, and keeping a most accurate record of all time spent.

But that does not cover the cost. What is the value of an apple tree in bearing condition? I have figured it upon the basis of \$10; six per cent on \$10 is 60 cents, which must be charged. The depreciation is two per cent. Some say that I am wrong there—that I have so improved these trees that I should not charge anything for depreciation. Others say that an orchard that is in a healthy condition can be kept so without any loss. But I find that there is loss. At any rate, I find that it is a practice which holds in all business. I am coming back to the statement of Mr. Bassett, that business laws must hold here as well as elsewhere. Every sound business man is setting aside a sum every year for depreciation, for a sinking fund, that when the time comes when he needs a new mill or new machinery, he has something to draw from, out of the business. And, therefore, in this case it must be charged up to the apples upon the trees, and I have charged two per cent, that is, 20 cents. I have charged two per cent for depreciation of machinery, etc., 20 cents; two per cent for taxes at \$100 per acre which would be five cents per tree, 40 trees to the acre, and I have a total there of  $\$1.60\frac{1}{4}$  as the cost to me when I am ready to pack the fruit. Now the barrels cost me 36 cents; two cents to move the barrels to the orchard; two cents to move the apples from the orchard to the storehouse, a barn across the way; three cents to move the apples from the barn to the station for shipment; 18 cents to pick. There is 66 cents more to be added to the cost of the apples—the

\$1.60 $\frac{1}{4}$  is per tree. Vary those figures as you will, of course, under different conditions, the fact still remains that those items have all to be counted. They are all in the wash somewhere. When a man says to me, "I don't charge anything for my team, I have to keep a team anyway," he is not honest with himself. Unless we can make this business pay all these charges and give fair returns upon the investment, we better get out of it, it seems to me. I have here 60 cents per tree, interest money, which, allowing 40 trees to the acre, gives \$24 an acre, and this makes a good investment. If I could grow apples upon a large scale, pay these charges which I have indicated here and sell the apples to cover same, I have a good business because I have my six per cent on my investment, and it pays.

If the yield is but one barrel a tree, and that is as good as we are now getting in the State of Maine, you see where we find ourselves as business men. Take the lean years with the fat, take every poor tree in the orchard as we must, count the whole of them, and while individual cases that I know of have exceeded this, yet I believe that I am safe in saying that the average of the State of Maine does not exceed one barrel per tree. I have one tree that has averaged two barrels and three-quarters for five years; and there is another in the same row, as large, seemingly as flourishing and as healthy, that never has produced a barrel in any one year. I wish somebody could tell me why. I don't know. I have puzzled over that tree to find, if I could, the cause. There is a Baldwin tree in the field that has not produced over half a barrel in any year since I have been there. Another has given me an average of almost two and one-half barrels. Now I have to count those poor bearing trees with the others. It would not be wise for me to take that good bearing tree as the measure of production, but I must count every tree that is in bearing condition. Then I have to count the lean years with the fat. There is an orchard across the lake, a mile and a half from me, that last year produced 1350 barrels of apples, and this year 90—a few years ago 2000, later 30. How are you going to figure the business?

We have bulletins, giving the cost of production of last year's crop, which are misleading, because last year's crop was an abnormal one. See where we are this year. The town of Monmouth last year shipped between forty-five and fifty thou-

sand barrels of apples; this year it won't ship ten. How are we going to figure the production of our orchards. Upon either year? No, but take an average of ten years. I have only eight, and therefore my figures are not complete yet. My proposition is only a small one, I know, but still I have been keeping these figures to find out, if I can, what I am doing, and I am ready to stand behind the proposition.

All this being so, what is the first thing a man faces in the business? He settles down to this question of cost of production and says there are three things to do. I must increase production per unit, I must reduce cost and I must improve quality. Am I not right? I know of no other incentive, no other place for us to find the incentive. We have been told, and we know, that our apples are not as good as they ought to be. Go into the stores anywhere in the State of Maine and you will find the Oregon apples, or the extreme western apples, in the market. You ask for Maine apples, and they may have some; if so, they are in a box or barrel back somewhere and you do not like the looks of them. Remember that nine-tenths of all Maine apples are sold by the growers to be packed by the buyers, therefore the farmer is not responsible for the pack of that barrel.

We must find the incentive, brothers, which will force us to study these three points I have indicated, applicable in the business world, and certainly with us. How may I increase production of my trees? How may I improve the quality of the fruit? How may I at the same time reduce the cost to me? Those are the three great questions which confront us and which surely must be solved. While studying this question of quality we should eliminate varieties which have been popular in the past and are not today. We have wiped out in the premiums of recent years varieties like the Black Oxford. As years pass others will have to go, because they have had their day and have lost hold on the consuming public. We must give more attention to those varieties which the market wants. I am just going over the ground which Mr. Bassett emphasized—those varieties which the buyer wants, for what pleases the eye satisfies the consumer. There are only three or four varieties that are popular—the Baldwin, the McIntosh Red, the Greening and the Northern Spy, where it can grow to perfection.

We have been meeting a condition in the Northern Spy, this year, which we have not met in the past—that hard, woody condition all through the apple. We have also been meeting, this year, pests we never knew of before. One of our noted naturalists, in a book lately published, makes the statement that the next great war that is fought in this country is not going to be man against man, but man against the pests. In that work we have presented facts which are startling and which claim our attention. Surely, we must give more attention to pests in the future than we have in the past, if we are to grow the quality of fruit which would be above the standard of today, as it must be in order to make this a good business proposition.

So these three points I want just to leave with you as the three which are to be emphasized, and which the study of the question of cost will force us, I believe, to investigate more critically than we have in the past. Find the cost of production and, finding that, find the incentive to investigate more thoroughly, more carefully and more critically how we can improve the quality, how we can increase the yield, how we can reduce the cost. And I believe by so doing we will eliminate the multitudinous number of varieties which are today to be found in so many orchards, and we will be getting down towards that business basis which means the growing of those which are most popular, most uniform in quality, best adapted to our locality, and for which the buyers are ready to pay the highest price. Where the Northern Spy can be grown in its perfection, there is no apple that can exceed it as a popular variety.

I think I have covered the points, Mr. President, that I wanted to bring to you. I do believe that this question of cost of production, which we have not touched in the past as we must in the future, is one that confronts every man, and while some may say it does not cost me any such sum to do my work, yet I want to ask today how many men have been keeping, for a series of years, an accurate account of the cost of production by hours or days of men and team, the cost of items of spraying—how many? Until we do this, do you not see it is simply a matter of guess-work with us. We must get right down in this business and find out, and finding, I believe we then have found the incentive for future work of growth and improvement, and will find also that we have a saner and a safer business than we realize today.



In any attempt to solve the problem of cost or possible profit, more attention must be given to increase of that variety which finds in our soil its most favorable environment. Never mind if actual experiments must be made on every farm to finally decide this problem, it lies so close to the pocket book of the grower that its importance cannot be overlooked. Make the environment of your trees so congenial that they may be incited to do their best and the problem of profitable orcharding will be solved.

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### OUTGO AND INCOME OF A TEN-ACRE APPLE ORCHARD.

PROF. U. P. HEDRICK, Horticulturist, Geneva Experiment Station, Geneva, N. Y.

I take it that you men before me are all growing fruit for the money you can make. In common parlance you are business men. Yet in this day, in which efficiency is the slogan of business, how many of you have precise knowledge of what your capital and labor are accomplishing? How many figure accurately profits and losses? If making money, how many can find the goose that lays the golden eggs? If losing, how many can locate the leak? How many have made a physical valuation of the property in his possession and actually know his assets and liabilities? At the risk of being thought presumptuous I venture to say that not many in this audience can give anything like a clear statement of the financial condition of their business. Yet I do not believe that any one of you is wilfully negligent of your money matters, but, lacking data with which to start and method with which to keep track of the outgo and income of your orchard, life spins past with your business affairs in a tangled skein which you hardly dare attempt to unravel.

No doubt before me are a number of men from city or town who are planting orchards—beginners embarking upon what seems to be a pleasing hobby and yet one capable of giving a living and an income for old age. Possibly all will go well. It is to be hoped that your castles in the air will materialize, but



if your venture is founded on the figures you have seen in some of the mushroom magazines, or on the occasional phenomenal crops that nearly every orchard bears, the chances are you will find the times out of joint long before your plantings come into bearing and will take to building aerial castles in some other profession. You will learn through experiences dearly paid for that many of the cocksure statements you have read or heard are but the stuff dreams are made out of; that figures often pass through the transformation that Alice in Wonderland underwent when she drank from the magic bottle and immediately grew to gigantic proportion. Thousands of newly-fledged fruit-growers, the country over, who are now drawing checks on the bank of expectancy, will leave money rather than take it from the field of horticulture. You and they might not thus have been deluded had there been anywhere a substantial body of figures from which could have been obtained a true conception of the financial conditions of fruit-growing.

We are well justified in saying that with increasing competition, manifold uncertainties in orchard conditions and unbusinesslike administration, fruit-growing is becoming a more and more risky business. In the hands of the careless and uninformed it is likely to prove as unstable as a house of cards. Of all this you need to be reminded rather than informed; for, experience and the teachings of years have given the old hands among you, at least, knowledge of the uncertainties in growing fruit and now, everywhere we are hearing discussions of the business side of the industry. Temporarily the "idea of making two blades of grass grow where one grew before," with which agriculture has been chiefly concerned in the immediate past, is eclipsed by the conception, just beginning to be realized, that agriculture is a rather highly developed enterprise requiring for success careful business management. We are beginning to realize, too, that in neither the art of production nor in the business management are the difficulties transient troubles to be solved once for all; rather they are permanent problems made more urgent daily by new complications and keener competition.

Coming now to the subject of my paper, "The Outgo and Income of a Ten-Acre Apple Orchard," I have to say that it is presented with the hope that it may prove a helpful contribution to those who want data on the cost of producing apples and on

the yields, selling price and profits in the culture of this fruit. I hasten to say that you must not expect anything like a full consideration of the subject. Neither time nor material suffice for that; for, keeping accounts in apple-growing is a difficult and complicated piece of business. The yearly inventory and striking of balances, which do very well for the grocer and butcher, do not begin to tell the whole story in fruit-growing. In growing apples, for instance, it takes several years to bring an orchard in bearing, after which it barely maintains itself for a decade or two; the lean years and fat years are more accentuated than in most other industries; advantages and disadvantages are exceedingly changeable; and the value of the investment is variable. Indeed, fruit-growing is not far removed from gambling pure and simple, and I imagine a gambler has trouble in keeping accounts.

The only possible way to obtain an absolutely accurate reckoning of the profits and losses of an apple orchard is to add the expenses for the whole life of the trees and subtract from the total income; the remainder, if plus, is the profits; if minus, as will be most often the case, the losses. This plan might have been feasible for Methuselah, with his 969 years, but in our short span of life it will not work. Since annual accountings are not fair, and total ones not possible, we must divide the life of the orchard into periods and take data for each division. In this region, where the apple lives as long as man, we may make from the life of an orchard seven periods of a decade each, similar to the seven ages which Shakespeare allotted to man. The seven periods ought to make very fair units for the collection of data.

Unfortunately we do not have for any one of the seven periods much accurate data either as to the average total cost of production or the cost of any one of the several orchard operations, nor do we know much about the average cost of the materials used in orcharding, or the average selling price of the produce of the orchard. Now the value of such data is obvious to those of you who are making any attempt to keep track of the finances of your business, and the object of the present paper is to put you in possession of figures that, rightly used, ought to be helpful. I say rightly used, because most figures are capable of several interpretations and all are subject to the lapses and mistakes common to erring mortals.

The fruit to be considered is the apple as grown in our orchard, situated a few miles west of Rochester, New York. Added value is given to the figures I have to present, by the fact that the orchard was selected for experimental work because it was as typical as could be found of the great apple belt of western New York. The trees are Baldwins, twenty-seven years old at the beginning of the experiment, thirty-seven now. Our accounts tell what each of the orchard operations has cost, the number of bushels of fruit produced and the selling price. In short, we think we have something substantial to show what the outgo and income of a New York apple orchard is in the fourth decade of its life, the period just preceding prime of life. We shall give the data, as far as possible, for three units, the barrel of apples, the tree and the acre.

The first information we must have in getting at a problem is the number of barrels of apples per acre, per year. The exact number for the cultivated plat in this ten-year average is 116.8 barrels. Graded, the acre average for the period is 79.2 for barreled stock; 37.6 barrels of evaporator and cider stock. Reducing these figures to the tree unit we have for barrel stock 2.93; for evaporator stock 1.4. Total per tree, 4.33 barrels. The proportion of evaporator and cider stock is seemingly high—made so by two autumn gales, in different seasons, which gave many windfalls. Such episodes come in the life of every orchard. Yields per acre will vary greatly with the same variety in different orchards, even in the same section, but there is little reason to think that the ten-year acre average just given is much above the mark for orchards that are cared for—well tilled, sprayed and pruned plantations. It is, of course, much greater than the average yield of Baldwins in New York for the reason that fully half of our orchards, to the shame of the state, are wholly or partially neglected.

The first item in cost of production to be considered is interest on investment, and we come at once to an entry in our account over which there can be much disagreement. What is a Baldwin orchard in full bearing, in the prime of life, worth? Sales are too few, and most of those that take place are made under conditions too abnormal to make selling price a safe gauge of value. Suppose we make the value \$500 per acre and call the interest five per cent. This valuation is not high, for it includes not

only cost of land, trees and labor for the deferred dividends of the first twelve or fifteen years. It is sufficient, too, to cover the overhead expenses of houses and barns—or, at least, the share of these charges that would fall to a ten-acre orchard in New York. Our first expense item, then, is \$25 per acre on investment, a sum which, divided by 116.8, the number of barrels per acre, gives us a charge per barrel of twenty-one cents as interest on investment.

Taxes vary greatly in different counties as they do somewhat in different years in the same county. Since this orchard is but a part of a general farm, we can only estimate the cost of taxes. There are few regions or years in New York in which taxes for such an orchard would be over \$1.50 an acre, making the tax on each barrel of apples 1.2 cents.

The next account to be charged to cost of production is depreciation in teams and tools, and interest on the money invested in them. First-class machinery for running the average orchard will cost in the neighborhood of \$1,000, the items being as follows: Teams \$400, spraying outfit \$250, harness \$50, wagon \$75, plow, harrows, ladders, crates, pruning tools, etc., \$115. The figures named are below rather than above average prices, but there are few instances, indeed, in which the tools and teams named would be used exclusively for a ten-acre orchard. If we set the depreciation and interest on money at 20 per cent for the above equipment we must add seventeen cents per barrel of apples to the depreciation account. Take notice that in obtaining the cost of production in the orchard under discussion the depreciation account must be thrown out for the Station hired all work done and the workmen furnished their own teams and tools. This item is put in, then, only as an approximation of what men who are doing their own work must charge for depreciation.

Passing now to orchard operations we find that the annual cost of tillage per acre for the decade was \$7.39, making the amount to be charged against each barrel of fruit 6.3 cents. Tillage consisted, in this orchard, of plowing the ground in the spring, after which it was harrowed, rolled and then cultivated by harrowing an average of seven times per season. The price paid for team work at the beginning of the period was \$4 per day of ten hours; but the price advanced to \$5, a fair average



being \$4.50. Tillage includes the labor of putting in the cover crop but not the cost of the seed. For the cover crop seed, in this orchard usually red clover, must be added \$2.74 per acre for seed or 2.3 cents per barrel of apples.

The expense of pruning per year per acre was \$3.56—since there are twenty-seven trees to the acre in this orchard the cost per tree was 13.1 cents. The cost per barrel of apples was three cents. The average price paid for the work was \$2 per day of ten hours.

The average cost per acre for spraying was \$11.28; per tree 41.8 cents; per barrel of apples 9.6 cents. The spraying was done the first few years with a hand sprayer, then, for several years, with a Niagara gas sprayer, and the last three with a gasoline power outfit having two runs of hose. The first five years Bordeaux mixture and arsenite of lime were used; the last five, lime and sulphur and arsenate of lead. Now I come to a statement which I would hardly dare make in the presence of the plant pathologists and entomologists. The orchard was sprayed three times per season the first five of the ten seasons. The second five years it was sprayed but twice per season, the first application being the dormant spray made just before buds began to swell; the second, just as blossoms dropped. This treatment has given an almost perfect crop, wormy and scabby apples being rarities scarcely to be found in the orchard.

The last of the cost of production charges is that of superintending the work. The services of the average fruit-grower are worth more than the \$2 per day, allowed for actual work, and this deficiency should be made up by a charge for superintending the work. The Station paid for this service \$300 per year. This, in my opinion, is a fair price, since there are few competent orchardists who could not superintend a farm enterprise of several times the magnitude of a ten-acre orchard. The charge to be entered against a barrel of apples, then, for superintending is twenty-five cents; against the acre unit, \$30; against an apple tree, \$1.10.

Picking, packing, sorting and hauling have been done in diverse ways during the ten years and the items cannot be segregated. But the total cost of these operations has been 24.4 cents per barrel. The apples, it should be said, were sorted and packed in the field. The crop was hauled to the Station,



one and one-half miles away, over a country road not better than the average.

The following is a summary of the cost sheet for a barrel of apples:

Interest on investment.....	\$ .21
Taxes .....	.012
Tilling .....	.063
Pruning .....	.03
Spraying .....	.096
Cover crop .....	.023
Superintending orchard .....	.25
Picking, packing, sorting and hauling.....	.244
	<hr/>
	.93

All of the first and second apples from this orchard have been packed in barrels. The average price of barrels for ten years has been thirty-six cents each, the price having fluctuated from thirty to forty cents. The culls have been handled in crates and a charge for packages cannot be entered against them. Adding the cost of the barrel to the cost of production we have \$1.29 as the total cost of a barrel of apples.

We come now to the average price of apples for the past ten years, as grown in this orchard. We have received an average of \$2.60 for all the barreled stock sold, which includes firsts and seconds. For evaporator and cider stock we have received sixty-seven cents per barrel, rather above the average, possibly, because two seasons' gales of wind, as I have said, gave an abnormally large quantity of very good windfalls.

We are now ready to calculate profits and declare dividends: Subtracting \$1.29, the cost of a barrel of apples, from \$2.60, the amount received, we have a net profit of \$1.31 per barrel for firsts and seconds. Multiplying by 79, the number of barrels per acre, we have \$103.49 as the profit per acre for firsts and seconds. Subtracting 72 cents from 93 cents we have 21 cents as the difference between average cost of production and average selling price of culls. Multiplying 37.5, the number of barrels of culls per acre, by 21, we have a loss of \$7.89 per acre on the culls, leaving the average net profit per acre, in this

orchard for the past ten years, \$95.60; add to this the \$25 interest on the investment and we have \$120.60 net, or 24.12 per cent as the annual ten year dividend from this orchard.

In closing I must make several general statements.

The first of these is that we have not been skimming the pan in this orchard work, and the milk that is left is equally as good as that we have taken. We shall expect this orchard, barring accidents, to do as well, or rather better, during the next twenty years than it has in the past ten.

Secondly, as good or better dividends are coming from many New York apple orchards similarly situated and similarly cared for. The figures given are a fair average for a Baldwin orchard in its fourth decade. The cost of production is, if anything, high, since the state cannot do work as cheaply as an individual. The extra cost, if such there be, has been offset, however, by the skill and efficiency with which the superintendent, in direct charge of the work, has managed every detail.

Third, the profits of this orchard are probably many times greater than those from the average plantation in New York. Indeed, I suspect that if we had the financial history of every apple tree in New York we would find that the total cost of all quite equals the receipts from all—in other words, many are losing and few are winning. This is the history of financial endeavors in all industries.

Fourth, and in conclusion, the dividend of 24.12 per cent on an investment of \$500 per acre stands for the opportunity in the hands of the apple-growers of New York. It remains for the individual to accept and make the most of the opportunity or to neglect it. Ali Hafed, a prince in India, sold his estate to search for diamonds in foreign lands. His successor, watering his camels in the garden, saw the gleam of gems and found acres of diamonds, and Ali Hafed's estate became the Golconda mines. Had the Indian prince had eyes to see he would have had boundless wealth at home instead of poverty, starvation and death in a foreign land. And so there are bonanzas in growing apples right at hand for those who have eyes to see and hands and brain to work.

## QUESTION BOX.

IN CHARGE OF A. K. GARDNER.

MR. GARDNER: We have listened to these outside speakers on various topics, we have had a chance to question them and talk over many of the questions here, but there are many others that we have not taken up and that we can take up now among ourselves. Now we are all at home. At the Grange hall everybody is able to get up and talk and give his views, and we should do the same thing here.

Question: I would like to call on you to answer question 1.

MR. GARDNER: I think that is not in the agreement, as I understand it, to call on the chair.

No. 1. Who has found it profitable to pack the best apples in boxes? I will ask Mr. Johnson to give his views.

MR. JOHNSON: Well, I will say that I never raised any apples to pack in boxes. I think by all means it would be much more profitable to pack the best quality apples in boxes. To give an illustration, I was out in the country a few days ago, looking over some orchards, and I came across some apples that were very good in quality and looks, and I offered the man \$2.75 a barrel on the trees, to go out and pick them, and I would have my apple shooks sent up and pack them in boxes myself. Well, I took a sample of those apples down to the city, showed them to some of the dealers, and I was offered \$3 a box for every box I could produce. Now there are practically three boxes to a barrel. That would be at the rate of roughly \$9 for what you would pay \$2.75. Of course you would have to take out the expense of the box and your own labor. But I doubt if those same apples were put in barrels you could get as much money for them. And I think just as soon as we put some of our fancy quality apples in boxes we will get more money.

MR. ———: I had thirty-one barrels of apples this season, something entirely new to me. Being out of a job I wanted something to do. I got thirty-one barrels. I packed eighteen standard boxes for which I got \$3.25 apiece. My boxes cost me 18 cents in shook, and I packed the apples and wrapped each one in paper, and sent them out the best I knew how. They

were glad to buy them at \$3.25 a box. I had some trouble in selling my No. 2's.

Question: What variety was that?

Answer: Baldwins and Northern Spies.

MR. CONANT: I think it is nearly always understood that very few apples in Maine have ever been put in boxes, and I thought perhaps this question would be an important one at this time. It is my judgment that with some of our best grades of fruit, that is, the best table varieties and those in fancy grade, it is profitable to pack and market a certain per cent of them, at least, in boxes. We, as a coöperative body, in Oxford county, have had a little experience in boxing some fruit, and we find it profitable to box some of the fancy grades of certain varieties and market them that way.

Question: What were the principal varieties?

MR. CONANT: We boxed fancy Baldwins, Northern Spy, McIntosh Red, and some Fameuse.

Question: What per cent?

MR. CONANT: A very small percentage. It would be impossible to tell the percentage of those taken from the tree. I spoke only of the fancy grade. I think it will not be profitable in Maine for years to come to pack anything but the fancy grade in boxes. I think the lower grades should go in barrels.

No. 10. Have any of our members tried parcel post to market their apples and with what results?

DR. TWITCHELL: I marketed nearly a hundred bushels of plums last year very largely by parcel post, shipping them in carriers—peach baskets—four and six quarts, principally in six quart baskets.

I would like to ask Mr. Conant, going back to the other question—out of 100 barrels, how many boxes one would get?

MR. CONANT: Well, I think it would be impossible for me to give you any figures on that, because we never kept any account. We were not trying to get data on that question, simply taking out the better grades and packing the others, practically at the same time, so it would be impossible for me to give you the figures on that. All is, I know this, we made money with certain varieties by selling them that way. For instance, a box of Northern Spies, running from 72 to 81 count, would bring \$2.75, while a good barrel of No. 1 Northern spies would bring



perhaps \$3. You have got to get but a small per cent of fancies to increase the income per barrel.

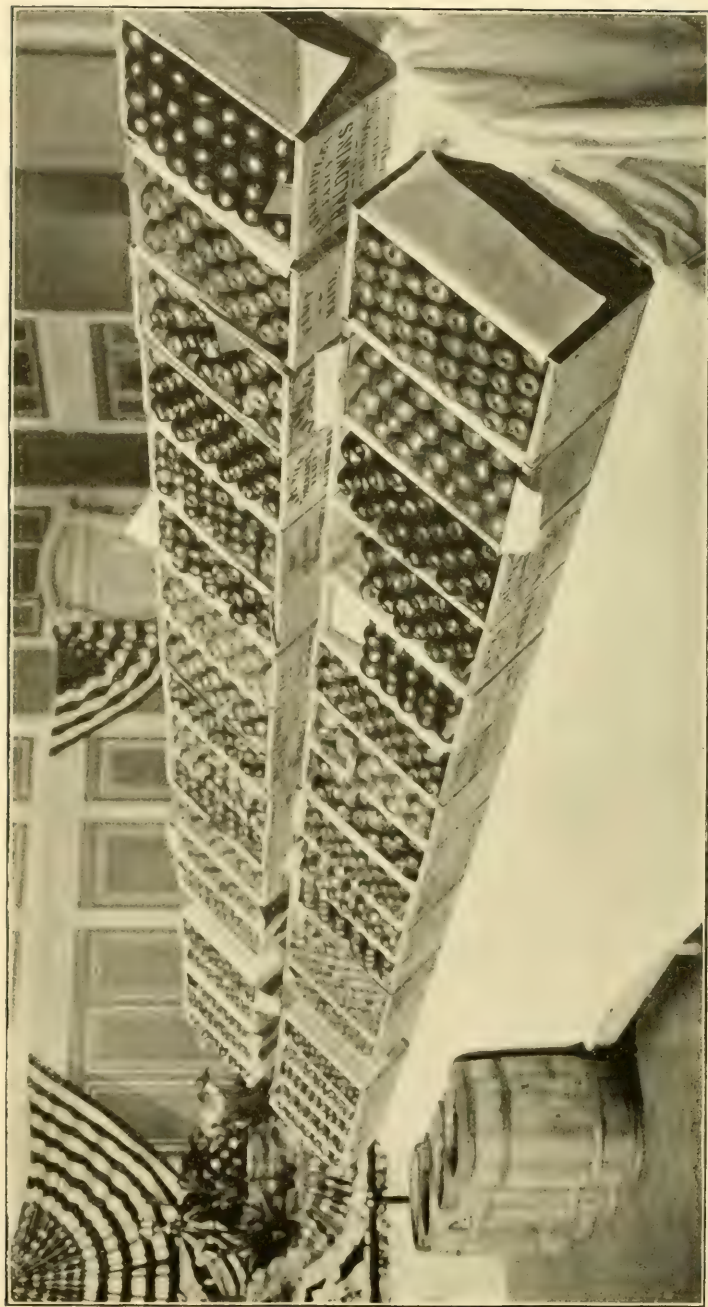
DR. TWITCHELL: I was thinking, out of a hundred barrels, how you would pan out—your number 2's?

MR. CONANT: It would depend wholly on the per cent of fancies you grew, the quality of the lower grades, whether you would be robbing your lower grades to get this fruit, but if you are really growing fancy fruit, you can sell some fancy fruit and yet pack No. 1's and good No. 2's, without robbing those other grades. For instance, one of our growers last year graded fancy Baldwins from his orchard, quite a large per cent—I am not able to give you just the figures, but a large per cent were graded from this man's orchard, and yet when we came to figure up his lower grades, 1's and 2's, he had then a higher per cent of No. 1's than nearly any other member in our association. I remember that very distinctly, and it is quite an interesting fact, that he packed a lot of fancies and yet his No. 1 grade ran higher than any other member of the association in that particular variety.

PROF. HEDRICK: Some six or eight years ago, in our state, men at Cornell University, who were talking marketing, and the extension workers as well, were all advocating the box package for apples, especially for fancy apples, and for some two or three years a goodly number of the growers did attempt to put apples in boxes and sell them. So far as I know nearly all of them have stopped. Now I don't want to discourage, in the least, the box apple proposition in this state. Your orchards will average smaller, as I said in my talk. Your fruit is better colored. It has more fancy than ours. And yet, I am inclined to think that I would like to discourage any effort that looks toward getting \$3 a box for apples. It is all right for the individual, but if we are going to attempt to get a fancy price for any considerable quantity of our apples and sell them only to people who live on Wall street and do that sort of thing, five cents at the fruit stand, we are going to discourage tremendously the use of apples by the common people. As I look at it, the grower ought to be content with a big crop and fair prices. Let the consumer have them at a fair price; he ought to exert his efforts in every way possible to gradually increase the consumption of apples everywhere—among the







Portion of the Box Exhibit at Annual Meeting, Maine State Pomological Society, Portland, Nov. 2-4, 1915.

common people, the working people, sell to them at a reasonable price. You simply cannot do it if you put them in boxes. There are advantages in the box, of course—it is handier. You can buy a box and take the fruit home. The bushel basket with a cover is a better package. You can sell the fruit more nearly at a price that common people, average people—not those who live in luxury—can afford to pay. And so at our Station, and Cornell has joined in the effort, too, in New York, we are now trying to tell our apple growers to cut the expense every way possible and yet grow a big crop of apples, give a fair, honest pack, accept a price that will remunerate them and give them a fair profit, distribute them as generally as possible, and get everybody in the United States to eating apples at a price they can afford. Now you can't do that with box apples, although, of course, you will understand there is a certain demand for box apples, and if you have the stuff to put in boxes it is up to you to get the high prices that have been mentioned here.

MR. —————: It seems to me we should have some smaller package in addition to the barrel. For instance, take our McIntosh Red and put it into a barrel; you are going to bruise a good many of them. It is not a barrel apple to my mind at all.

PROF. HEDRICK: Our growers are shipping a great many apples in the bushel basket and it is a good package, putting a peg in the center of the basket so the cover rests not only on the sides but on this peg in the center. They ship a great many apples from the Hudson and some from Western New York, and a great many people in Michigan. Tremendous quantities of peaches are shipped in bushel baskets. It will answer all the purposes of the box, so far as a small package is concerned.

Question: What about the peach basket?

PROF. HEDRICK: I should think they might well be packed in peach baskets,—the McIntosh, fancy products. It would take less trouble to pack a peach basket than a box. It is not an easy job, as any one knows who has tried it several times, to pack a box of apples and do it decently. It is an expensive operation and it takes too much time, and only the fancy trade can take those apples. Please don't think I am trying to discourage the selling of apples in boxes, if you have the box stuff and want to put it up that way, but I should be sorry to see all the apples boxed, because it would mean that none but wealthy people could buy and eat apples, and that is wrong.

MR. CONANT: I don't want Mr. Hedrick to go back with the idea that we are all planning to sell our fruit in boxes. Such is not the case. Our aim is to grow good barrel apples and sell them at a reasonable price, and also to increase consumption. But speaking of certain table varieties, I question whether we could ever ship to the markets out of New England in such a package. It has to go out, from the fruit growing districts in car load lots to get the minimum rate, and I question about the basket package ever being a practical package to pile into a car.

PROF. HEDRICK: They do peaches right along. You can handle them splendidly.

MR. —————: I am glad to know that, but it did not appear to me it would be a proper package for us to try to ship apples in by freight, quite a distance.

MR. GARDNER: I would like to ask Prof. Hedrick—is that a heavier basket than the ordinary?

PROF. HEDRICK: No, it is the common bushel basket with a board top and a round peg that sets down in the middle of the basket that the top rests on, as well as on the side, so that in stacking them the upper layers of baskets do not rest on the fruit in the lower layers. There is no crushing the apples at all.

Question: Can you give us the price of those baskets?

PROF. HEDRICK: I can't give you the price offhand, I think it runs from twelve to fifteen cents a package.

Question: Not as much as the boxes?

PROF. HEDRICK: No, not as much as the boxes—not with the expense of packing.

MR. KEYSER: I think when we talk about box fruit we are apt to overlook the fact that apples are of many varieties and numerous grades, and when they get into the market they reach the various channels, as a rule, where they belong. I believe the fancy table apples should be boxed. I don't raise the fancy stuff. Mine are largely Baldwin and Greening. But a short time back I was talking with Mr. Hallowell, of Philadelphia. Mr. Hallowell has the fruit business on the Pennsylvania railroad division between New York, Philadelphia and Harrisburg, which we all recognize as very considerable. Mr. Hallowell told me fancy apples like McIntosh should be put up in some shape—like two dozen in a package, that can be sold at their fruit stands—that a man can carry home with him at night to

his suburban home. He says we have no idea what the demand is for a package of that kind. You go to the large cities today—Dr. Twitchell will bear me out—watch them leave the New York Central in the fall of the year, and you will see hundreds of them trooping through the station, going to their suburban homes, carrying one or two baskets of grapes; and that same rule will apply to such fancy varieties as McIntosh Red and some special varieties. But at the same time we don't want to get the idea of boxing everything or anything. That is all wrong. It just applies to a few special fancy table grades. But he says there is a demand for that kind of a package, and a big demand, something that can be carried from these fancy fruit stands without any expense.

PROF. HEDRICK: I can quite agree with all that. I only want to say a word in regard to the main part of the apple crop.

MR. KEYSER: I think so, too. For our commercial apple the barrel is undoubtedly the package.

Question: Don't you think one of the reasons why the average consumer can't buy your fancy fruit is on account of the high price the retailer charges? I was in a store the other day. They had some Wealthy apples, raised and packed in Massachusetts, and they had a tag on them, fifty cents a dozen. Now look at the count on the end of the box. It was 138. That is practically twelve dozen. This would be around \$6 a box. I went up to the fruit man and asked him what he had to pay for the box to the grower and he said \$3.50. Now you see the retailer is making \$2.50 a box profit. If he could only cut the price a little, I think that fancy stuff would get in more hands and increase the consumption.

PROF. HEDRICK: People are going to buy oranges and grapefruit when they have to pay that price for apples.

PROF. BROWN: A year ago the students at the college packed some hundred boxes of apples. Not having fancy and No. 1, we pack No. 2. Some culls got in, by the way. Not knowing what to do with them, I sent them to Boston, and I can say that the price I got was equivalent, if not a little better, than the same class of fruit in barrels. The box cost me practically the same as the barrel. The students' labor probably would have thrown the balance the other way. But the point is this: That people in the cities who buy No. 2 in boxes will buy culls



and anything in boxes just as quick as they will in barrels, and I think a great many will buy them quicker. The question is also raised about the percentage of fancies. We barreled some 200 barrels of Mildings from the tree, as they were picked. The orchard was fair, nothing extra, and as I remember the figures, fancy, 3%, No. 1, 17%, No. 2, 35%, culls balance 45%. I think it is typical of most of the orchards.

MR. GARDNER: I was in an orchard this year, and in a McIntosh grade I will guarantee that 80% of them could have been boxed as fancy this year.

MR. KEYSER: That is where you need to box.

MR. GARDNER: It seems to me, however, in addition to that, as long as we are doing an export trade, that we have got to consider the barrel pretty seriously, because it doesn't appear to me that the box would ever stand up under it.

MR. YEATON: I went into an orchard which packed out 97 1's and fancies with three that were culls—those that dropped.

MR. —————: I would like to hear No. 5 discussed. I should like to hear from Prof. Hedrick on this question.

No. 5. On account of the cultivation of orchards producing heavy foliage should not the trees have thorough pruning to let in the sun?

PROF. HEDRICK: One principle of pruning is to stimulate growth, invigorate the tree, renew its youth. I would be afraid if you undertook to prune a tree severely you would get an even greater growth the next year. On the other hand, without any question, it is necessary and altogether desirable to thin out the top of the trees, occasionally, so that the sun can get in. But to prune heavily, to cut out a lot of the foliage, will give you more foliage and greener fruit the next year than you had before. That is a remedy that will have to be applied pretty carefully, and more often the remedy will fail than work. The pruning knife is often like a sword in the hands of a child. It must be used skilfully and carefully, if you are going to get good results.

MR. GARDNER: You consider that also applies to pruning or thinning, taking out small branches?

PROF. HEDRICK: Well, that is pruning, and the more you cut out, the more you stimulate the growth, the more you are going to get the next year. Unquestionably, some pruning should be

done to open the tops of trees, but a severe pruning, a heavy pruning, is going to augment the trouble, rather than lessen it.

MR. GARDNER: May I ask whether in New York State you prune in the early part of the tree's growth to what we term an open top?

PROF. HEDRICK: No, very few New York growers prune to secure an open top to the apple tree. They leave the center in. They like a two or three story tree. It gives much better bearing surface than the open center. Of course many factors enter into pruning. Suppose your orchard is in sandy, gravelly land. The normal growth is small. Under such conditions you can prune heavily. But take the reverse, the heavy land, the rich land, the trees are making a large growth. Too often the owner thinks, "I must cut down, curtail the growth of those trees. I am going to do it by pruning." He simply augments the trouble when he prunes heavily in such soil. Then there is all the difference in the world in varieties. Some sorts, like Baldwin, Greening, Northern Spy, large growers at best, ought not to be pruned nearly as heavily as Rome Beauty, Wealthy, Jonathan, or even McIntosh, although the McIntosh is a fairly thrifty grower. It is a general rule, the poorer the soil the more you can prune, and it is also a general rule, the weaker the growth of the tree, normally, the variety, the more you can prune. All those things have to be taken into consideration.

Question: Do you think that is one reason why you do not get better colored fruit there as you do in some other sections?

Answer: That is one reason, and then the fact that we like dollars and cents, and that apple buyers, as a rule, will pay no more for highly colored fruit than for that that is less highly colored, and size and quantity in fruits are antagonistic to color in fruit, and so our growers aim to get the maximum size and the maximum quantity rather than the highest color. They make more money by so doing, at least temporarily.

MR. GARDNER: We have been troubled this year, particularly, with blotch on fruit, laying it primarily to our wet season, but we get a good deal any season where the trees are very thick.

PROF. HEDRICK: That is another factor that has to be taken into consideration in pruning.

No. 4. Are we to expect more money in the future for apples, as a result of the grading and packing law?

MR. KEYSER: That is a very hard question to answer. I should say, in a general way, yes, while, of course, no law makes a man honest. You cannot force him to be honest. The gentleman here yesterday, from Liverpool, told you that the grade of fruit that was received last year was much better in grading and packing than it had been for years, and was in better demand, and would receive a slight advance in price. I can only answer the question in a general way, yes, because I think anything that has a tendency to raise the standard of anything in the market and make it a standard will cause a better price.

MR. —————: It seems to me that question was pretty well answered in the address given by Mr. Bassett this morning. I think there is not much chance for argument or discussion on it. He said that first we must have a standard. And it seems to me that if we pack our grades, as specified in this law, we certainly will have a standard. When we have a standard we have something definite, something that can be relied upon.

Question: Who is going to determine what that standard is, when nine-tenths of our apples are sold by the growers to be packed by the buyers?

MR. KEYSER: It is the duty of the Commissioner of Agriculture to enforce the law. The law is about as broad as it can be made and be fair to the grower and fair to the consumer at the same time. What we were aiming at, largely, was the strictly dishonest pack. That is what we were after. And that there was such a pack, no one denied—couldn't deny. Of course the standard must vary in different sections, and vary from year to year. The standard this year is not as high as it was last year, even if they were packed according to the law. Nothing to prevent it, unless one set of packers was doing all the packing. It is a big thing if we can get at it now in a general way, but the duty, of course, lays with the inspectors.

MR. GARDNER: It seems to me that the ultimate standard rests entirely with the court.

MR. KEYSER: Well, finally, of course.

MR. GARDNER: The temporary standard rests with the Commissioner.

Professor Hedrick is asked to answer question No. 2.—What are the best tools for orchard cultivation where trees are low-headed?

PROF. HEDRICK: Oh, I can't answer that question, Mr. Chairman. I have not paid much attention to tools. There are tools, and tools, and tools, and so much depends upon the soil and locality. There are as many tools as patent cereals. I know we have no trouble in getting low down tools and those that spread out, for our work in New York, and you must be able to get them here, but I can't give you the names of them. Some of the growers will be able to name them for you.

Question: Do you use the extension tools?

PROF. HEDRICK: We use the extension tools, and we have no tools with handles. We have a special harness, and try in every way possible to have a tool that can do as little injury to the tree as possible. At every exhibition of our Horticultural Society or State Fair you see a considerable number of these tools, most of them manufactured in the middle west, it seems to me. But there are plenty of them, good tools. Every orchard, I should say, or every type of soil, would need a tool particularly adapted to that type of soil. We have no stones in our state, whatsoever. As I came through New England I saw that you do have a few stones. I expect that the tools we use would not be quite the tools you would want on your stonier land.

MR. YEATON: In the cultivation of the orchard, in using the disc harrow we used a piece of chain, about six feet long, between the spreader and where the horses were attached, and we found that we could drive them in a zigzag way under those trees and we could get right close to the tree without doing any injury whatever—go back and forth, to the right of the first tree and to the left of the second, and then reverse that action coming back. We got right close to the tree without going to the expense of any special tool for the orchard work. We simply use the tools that we use about our common farming operations. That has been, with us, the most practical of anything, using the spring tooth harrow and the disc both, in that method, with the team. The question would naturally arise in the mind of every man here, "Isn't that hard on the team, having them hooked so far away?" We only use that going out and back; then we shorten that chain right up and put the team



back where it naturally would be hitched. That has given us remarkably good results and has lessened the cost of the orchard operations by saving one extra tool.

No. 26. To what extent should we force our young trees until they come into bearing?

MR. BRAGDON: I have done all that I could do to force my trees—that is, I have, moderately. The first year I used two ounces nitrate of soda, with wood ashes; the second year four ounces, and the third year following that I used about four pounds of 4-7-7—something like that. So you see my trees got quite a lot of fertilization. And I have pruned, whenever I have been near a tree. I have done most of it in the winter. My opinion is that you cannot push a tree much too hard to get it into bearing early. Those who have seen my trees—they are larger I think than any in the neighborhood, and most people are surprised to think they ever bore any fruit considering they grow so fast. And there are a lot of my trees I got two bushels of apples from this last fall—perhaps a hundred of them. The block that was in the Gregory competition that took fourth, we got almost five bushels of apples from; trees planted in 1910, one-year-old whips. I would like to hear the experience of some of the others in regard to that.

MR. GARDNER: That was with practically the mulch system all the way through, was it not?

MR. BRAGDON: Oh, yes. I might state that the orchard that scored highest—I have one block in my name, and that one that scored highest was in my wife's name. Of course I acted under her instructions,—they have been mulched very heavily, whereas mine were grown pretty much clean cultivation. The block grown under clean cultivation score eighth in that competition. Those entered in my wife's name were mulched heavily, in heavy sod—scored fourth. Those trees were looking very fine. They have grown very regularly. In fact they are putting on more growth now than any trees I have. This year they look much better than last year, in comparison with other trees I have. I am trying another block planted this spring under the mulch system, and one under clean cultivation, to see if I can satisfy myself that the mulch is the best in that locality. Those trees that I put into clean cultivation this year were put into a piece of land



that has been planted to potatoes two years running, and it is in excellent condition. The other block was put into an old field that has had nothing done to it for perhaps five years, only just to cut the grass, so that block is not getting the fair show that the other one is getting. Yet they have put on a good growth already. They were mulched very heavily with perhaps sixty to seventy pounds.

DR. TWITCHELL: What do you mean by forcing trees?

MR. GARDNER: I presume that would refer, perhaps, to an average growth of over eighteen inches.

DR. TWITCHELL: I have some trees that with two pounds of fertilizer, in the spring, made a growth of two and one-half feet. They haven't been forced, surely. They had a space seven feet around them, hoed, as I hoe my corn—weeds kept down. I have a row of trees in front of my bungalow that has made pretty good growth that haven't had any fertilizer since the second year, except what they have taken from the garden—they are alongside the garden—until 1913 when I broke the land on the other side and have planted it two seasons. Mr. Yeaton and Prof. Hitchings saw the trees this fall, circumference about sixteen or seventeen inches. They were set in 1909. Speaking about forcing trees, I don't know whether I have forced those or not. I haven't thought of it. I commenced with those trees set in 1910, putting two quarts of bone meal into the cavity before I set them, worked into the soil. Then I commenced on half a pint of fertilizer,  $4\frac{1}{2}$ -9-7 $\frac{1}{2}$ , and increased that every year, until this year they had two and a half pounds. The trees are healthy. This year they have made larger growth than before. Many of them made a growth of two feet to two and a half feet. But still I feel that there has not been any forcing process. There has been no thought of that on my part.

MR. GARDNER: Of course the main thought in young trees is not, perhaps, so much the amount of growth they put on as the amount of growth that ripens thoroughly before winter sets in. Of course if we don't have our tops well matured and well ripened they are going to suffer more or less from winter-killing, at least, checking the tree. Some of the Gregory orchards put on a large growth, and late, in cultivated gardens, where the cultivation was kept up during the summer, yet even on very

high ground where they would be subject to very little winter-killing, they were retarded for the second season and they never picked up sufficiently to get back to the rest of the good orchards, though they were given very good care.

DR. TWITCHELL: I have perhaps two or three hundred young trees growing. I never see any winter-killing. This row of trees in front of the house—one of them Prof. Hitchings and Mr. Yeaton measured and found the circumference  $16\frac{1}{2}$  inches about 8 inches from the ground—tree about 15 feet high, spread 20 feet, set in 1901. It may be the largest. Some others have not spread as much as that. Those trees haven't had any special fertilizer since the second year. Of course they are alongside my garden.

MR. BRAGDON: Those trees of mine that grow the most vigorously winter the best, always. You know the location of my farm is high, so that what growth I get, I get fairly early in the season. Therefore the wood would naturally ripen very well. But it was the trees that grew the best that wintered the best with me, and those that grew the poorest, it seemed, were the ones that died. Perhaps something was wrong with the tree in the start before it was planted.

MR. YEATON: It has been my policy to grow the tree as rapidly as was consistent with ripening the wood, until it came to a bearing age, because we have got to get a large bearing surface, if we are to get a profitable crop of apples from any tree, and with a fair amount of fertilization and cultivation we can get a good growth and still ripen them, and I have felt that it was a business proposition for us to grow them quite rapidly, during the first five years.

No. 9. Will not the high price of potash teach the farmers that they have been using too much potash?

MR. GARDNER: It seems to me that is a question that the potato growers might speak on better at this time than any one else.

DR. TWITCHELL: Mr. Emery makes the statement in a recent issue of the Farmer that in many cases where potato growers used their 4-6-10—had a little left over from 1914—used their 4-6-10 and alongside used their 4-10-4 or 4-8-4, that the yield was about double on the 4-6-10, and I think he closes with something like this statement—I don't want to be quoted as

giving his words exactly—this proves that we need a larger percentage of potash than we are getting at the present time, and with the prospect that we are going to get about one, next year, we don't know what we are going to face, if that is so. I don't know what the experience of others will be, but I have a strong feeling—haven't proven it—that with my trees I want a good per cent of potash in the fertilizer.

Question. If potatoes respond to potash, does it hold that trees will?

DR. TWITCHELL: No. I say I haven't proved it. I can't state that, as a fact, but I have that feeling with trees I have treated in different ways I have got better results—that does not prove, because I do not understand all the conditions which surround the individual trees.

PROF. HEDRICK: Mr. Chairman, I may state we are just closing an experiment on fertilizers in the apple orchard. This is the twentieth year we have applied fertilizer to an apple orchard in Geneva, New York. The check trees are yielding this twentieth year, and have yielded every one of the nineteen previous years just as much fruit as the trees we fertilize, except in the case of nitrogen applied as stable manure, and we don't know in that case whether it is the nitrogen or the humus. I wouldn't say that from what has happened there that is what would happen in Maine. But those are the conditions. An analysis of our soil shows us that the top foot of soil has potash enough for an apple tree bearing twenty bushels to the tree, to last 964 years, and phosphorus to last 450 years, enough nitrogen to last something over 100 years. Ours is a rather heavy clay soil. We published the results from this orchard five years ago, when we had been applying fertilizers fifteen years, and fruit growers in New York, very generally, especially in case of clay soils, are not now fertilizing. But we think the problem is to make available the potash and the acid phosphate and the nitrogen that are in the soil, rather than to buy fertilizer, though we do have an increase by the use of stable manure. But, as I have said, I do not know whether it is the nitrogen or the humus. We are repeating this experiment on fourteen orchards in different parts of the state on different soils, but you cannot tell anything about experiments until they have run four or five years, and ten years is better. Some of these fourteen orchards that

I speak of, especially those on the sandy soil, do show some results from phosphorus, as well as from nitrogen, but up to date we have not found any place in the state of New York where a tree responds to the application of potash. Now we may find that later, but we have not found it as yet. I asked Dr. Twitchell whether it would hold that because potatoes respond to potash, apple trees will. I don't believe it will. For this reason, the apple begins to grow early in the season and continues to grow until frosts come—heavy frosts at that. The potato does not have half the growing season, neither do any other farm crops. The apple has five or six years, before it begins bearing, to make growth and send its roots down. The apple roots have a feeding surface of six, eight, ten or fifteen times as much as a potato. They go way down and spread way out. You have no idea, unless you have dug up the roots, how far they spread out, sometimes thirty or forty feet, often fifteen or twenty feet. The product from apple trees is nearly all water, from eighty to ninety per cent water. The leaves go back on the soil. The apple tree is a heavy drinker. The leaves transpire more water in proportion than do the leaves of the potato. And for all these reasons I am inclined to think that the apple, and other fruit trees as well, need far less fertilizers, providing you are cultivating the soil and using every means available to set free the food in the soil than other farm crops, generally. You only need to look at your stony mountain sides and the tremendous trees that grow there to know that a tree can get along with relatively little plant food. Now don't misunderstand. Don't say that I said never to apply fertilizers to an apple orchard or any other tree. I haven't said that. On the contrary, I know, occasionally, trees do respond to the application of fertilizers. And I am sure they must have nitrogen. But I am inclined to think, in our state any way, and I am speaking now for New York, more money is wasted in buying fertilizers for apple orchards than is well spent.

MR. GARDNER: Would you say then that the principal factors were humus and moisture?

PROF. HEDRICK: Humus and moisture are more important factors in growing apples than plant food. The plant food in the average soil is there, if you only set it free. The fertilizer men don't like this kind of talk, and they everlastingly go at



me, but we have the facts for New York, and you have the same facts over here at Durham, N H., in large measure, and it will pay you to leave a few check trees in your apple orchard, if you are using fertilizers, and see what the difference is between the check trees and those you fertilize. Another point must be made. We have found that trees in sod will respond to fertilizer, whereas those that are cultivated will not. I have never seen it fail that an application of nitrate of soda to trees in sod would not produce results, and acid phosphate often produces results when they are in sod.

MR. MORSE: The Professor perhaps does not realize the difference between the cost of cultivating a soil like his and some of our best orchard soils up here. He says that we have no idea of the way the roots spread out, unless we have tried it. He has no idea how an apple tree would look down here, unless it is thoroughly cultivated or fertilized. I know just how they look, and after they have been fertilized, and I think that on a good share of our best orchard land it is cheaper for us to buy fertilizer and grow them that way than it is to give them thorough cultivation.

PROF. HEDRICK: Do you know whether it is potash, nitrogen or acid phosphate that does the business?

MR. MORSE: I don't.

PROF. HEDRICK: Are you sure it is not the nitrogen they want more than anything else. Don't you think stable manure with very little acid phosphate would give the results—if you should mulch them with stable manure, or plow under clover or vetch, wouldn't you get the same results.

MR. MORSE: If you should get a soil good enough for clover, it will bear a good tree, but you don't realize that a good deal of our best orchard land won't bear clover. Your conditions are so different from ours that we must take your advice with a good deal of care or we should get mixed up terribly.

PROF. HEDRICK: I realize that is true, and I realize that I ought not, coming here, to say much about fertilizer. But the question was on potash. I got into this discussion to bring out the point that I think it is nitrogen that your trees need, if you can get it—stable manure—vetch and clover plowed in, if you can get it. I may be wrong. I have had no experience in Maine. I may be altogether wrong, although I am banking a little on



these experiments that have been carried on over at Durham, N. H., on a soil not very widely different from yours and where the results were quite similar to those that we had in New York.

MR. MORSE: Don't misunderstand me. I said that on a good deal of our best orchard land it was cheaper to buy fertilizer than to cultivate the soil. I don't like to quote my own work, but of course I know more about that. We own an old farm, the trees set out on a hillside, and by using two or three pounds of fertilizer, costing four or five cents to a tree, on a tree that is two or three years old, we can get good growth. All we need to do is to spade around it a little.

PROF. HEDRICK: What would that fertilizer be, potash or nitrate of soda?

MR. MORSE: Well, I have used my own formulas and when I first commenced I used heavily the potash, but I have swung it round and on the growing trees I use about 4-7-4, I think, when I can get it. This question that came up here, it seems to me we have got to wait and see if we can get potash. If we can't we must get along without it.

PROF. HEDRICK: When you can't get it, try the nitrate of soda.

MR. MORSE: I have seen that tried and, as you say, it will always show increase. I don't know so much about it in thorough cultivation. I have been using chemical fertilizers for more than fifteen years, and, as I told them here yesterday, it seems now I have got to the point where I must have something else. The trees have gone back in the last three or four years. And now I think we must have humus of some kind. The question is, how shall we get it? The best orchard land we have is on a high hill, tremendously expensive to haul dressing there, if you can buy it—almost impossible to find it, any way. So it seems to be a question. I wish you could give me a tip on how to manage the trees and make them come back to the original bearing. We had wonderful success the first eight or ten years with our fertilizer. We thought we knew almost all about it—all we had to do was to set out an orchard, use a little chemical fertilizer, spray them a little, and we could raise apples and get rich right off.

PROF. HEDRICK: Grow rye or some crop of that kind to get more humus.

MR. MORSE: We have tried vetch, clover and rye.

PROF. HEDRICK: The humus I am sure the tree has to have.

MR. MORSE: That is the point and I wish you could tell me how to get it.

MR. KEYSER: Mr. Chairman, Mr. Conant as a member of the Station Council will find on his first visit to the state farm a block of twenty trees that have received the cultivation, the cover crop, the same as the adjoining blocks, minus the fertilization; for three years they have had no fertilization whatever. And the crop yield from those twenty trees has averaged up to the balance of the orchard. That confirms Prof. Hedrick's experiment that they are carrying on at Geneva, only in a much lesser way. This is the third year. At our meeting at Lewiston, two years ago, you will remember Mr. Woodworth stated that in the Annapolis Valley they had been doing fall plowing for twenty-five to thirty years, late in the fall, just before the ground froze, and that they had never had any bad effects from it. Consequently, two years ago, we took a block of trees at the state farm, and they are receiving now the second plowing; they have been through their first winter.

PROF. HEDRICK: Will you let me say in that connection that every acre of our two or three hundred acres in New York is now plowed in the fall and we wouldn't go back to spring plowing for anything. And ours is a heavy clay soil. We find the weather in the winter—freezing and thawing—has something to do with freeing the food elements in the soil. We plow our peaches and berries. The land is in better tilth the next summer because of the fall plowing.

Question: What time do you plow?

PROF. HEDRICK: We begin about the middle of October and keep at it till it is all done. Just as soon as the crops are off we begin to plow.

DR. TWITCHELL: Touching the use of application of nitrate of soda: I made an application of half a pound to see what the effect would be upon a couple of trees, half a pound in sixteen quarts of water, and sprinkled it out, just outside of the drip of the trees, and I do not remember of any one coming there during the summer—that is when the leaves were about three-quarters grown—and looking over those trees but that called my attention to these trees and the size of the leaves and

the deep color and glossiness. They were not treated in any way different, but just the addition of half a pound of nitrate of soda to a tree. I did that to see how small an amount would be noticeable upon the leaves.

No. 13. How shall we protect our young trees from borers and mice?

MR. YEATON: One time a fellow came along and said to a neighbor, "Come into the house and have a drink. I have just been making some spruce beer." They went into the cellar together. The whole top of the cistern was open. The fellow that went in walked along and looked in—"Don't the rats ever get into that cistern?" He says, "Yes, but we skim them out."

Question: That is all right for the borers, but tell me how to get the mice?

MR. YEATON: The most practical way, the cheapest, least expensive of anything we have tried is to take some wire screen or common window screen, make a very thin paint, lead and oil, cut the screen the size that we want, and just simply dip them in that lead and oil, and have a wire peg sticking up right over this dish to put them on and let them drip back in. That will last five years, and by that time you will want another job to put more wire on.

MR. GARDNER: One of the latest recommendations is heavy white paint, paint about eighteen inches or so.

No. 14. The San Jose scale is getting into our state. Shall we ask legislative protection?

MR. GARDNER: I do not know just exactly what that means, whether it means a spray law.

MR. YEATON: That is the idea exactly, whether the state should enact a law that will compel spraying.

PROF. HITCHINGS: Mr. Chairman, I don't believe in that sort of measure. I think some of our speakers have already intimated here at the meeting that the San Jose scale can be controlled and if there is a spot in the state where it has started it is for the Department of Agriculture to get at it and exterminate it. I hardly think that the San Jose scale will become a pest here in Maine, to any extent, and the thorough spraying that has been referred to will handle it as well as our oyster shell scale. That is doing more damage than the San Jose scale ever will, I think, in the State of Maine.

MR. GARDNER: It certainly is.

FACTORS IN MARKETING AND DISTRIBUTION OF  
APPLES.

J. C. ORCUTT, Secretary Committee on Agriculture of the Boston  
Chamber of Commerce.

(An Illustrated Lecture).

*Mr. President, Ladies and Gentlemen:*

I assure you that I am very glad to be here. I am not certain that I can give you such information as you would like, but will speak to you for about twenty-five minutes on the consumption and distribution of apples. Who are the users and the buyers of these apples? And then, if you would like to ask me questions, I would be glad to answer them, if I can. If I cannot, I will readily say so.

APPLES HARVESTED IN FOUR WEEKS, BUT MARKETED AND USED  
FIFTY-TWO WEEKS.

These apples which you people grow commercially are all harvested in about four weeks of the year—one month's time. Now at that time there are only 4-52 of the crop consumed. That is, every week of the year consumes 1-52 of that crop, and in these four weeks of the time you are harvesting this crop there are 4-52 consumed. In other words, there is picked and offered for sale twelve times as much each week as the market will ordinarily consume. Therefore, these apples must be stored, until each 52d rolls by, either in the cellar of the producer or in cold storage houses of the cities. In the country the ordinary run of consumers buy two to six or eight barrels of apples in the fall and put them down cellar. That takes care of most of their demands.

## CITY CONSUMERS' WANTS.

The average consumer in the city only buys what he wants from day to day, or week to week, that is 95% of them.

Now then, just a moment, let us consider the mass of consumers that we have, because they are the people that you must take into account if you wish to market your apples in a profitable way. You know no one can sell you an article that



you don't want, or in a manner which you don't want, or done up in a package which does not suit you. So, therefore, if you are selling apples, you should consider who these consumers are, and what they want.

Consumers may be divided into a very few classes, which we might call the wholesale consumers, i. e., buying in a wholesale way—and the retail consumers. Let us take first the retail or family trade. The family trade in the city, say 80 per cent of that family trade is from the working class, earning \$15 a week and under. The kind of apples they want to buy are these: First, apples for cooking, for instance Baldwins or Greenings; second, apples for eating, such as McIntosh or Gravenstein. The average consumer in the city does not want to buy a barrel of any one kind, for in the first place they have not any place to store those apples, and in the second place they do not want so many of one kind. The majority of the apples sold to the family trade are sold in peck or half peck lots. The household will order a peck or half a peck of Baldwins or other apples for cooking apples, and say a dozen of McIntosh for eating. Some other member of the family does not like McIntosh, so he orders half a dozen Gravensteins. That is the way the trade has been built up, selling the consumer what he wants and when he wants it.

Now we come to the wholesale trade, which is the great buyer of your apples, that is—hotels, restaurants, boarding houses, cafeterias, institutions. What kind of apples do these consumers want to buy? The restaurant keeper wants to buy a very nice grade of apples to put in his window to attract the people, the very nicest looking apples he can buy; second, he wants to buy a pretty good apple that he can use for a baked apple, but it can have some spots or specks, because he can cut those out and when brought on the plate the consumer won't notice it. Now then, for his apples to make sauce and pies, he wants to buy the cheapest apples that he can, because he is in business to make the most money he can. So for an apple to use in apple sauce and apple pies he will take most anything he can get. If we had some fine apples cooked and apples that didn't look so well cooked in apple sauce, I think we would have a very hard time telling the difference. This shows the three-fold wants of the restaurant keeper.



The baker wants, perhaps, two kinds of apples—one which would be a very nice kind of apple, which he can cut up in large slices to put in pies, and others to chop up for pies and mincemeat.

Now then, institutions of all kinds are large buyers of food in our large cities and towns (state institutions, or institutions for insane, or for aged people, or for delinquent boys, or whatever it may be). They want to get as good an apple as they can at a reasonable price. They do not want the fancy apples.

Take the fruit stand trade; there are two classes. One class wants the apples which will be the most attractive, nice colored apples. The other kind of fruit stand trade wants to secure apples in a general lot, ungraded apples, ones and twos mixed, so that they can pick out the number ones and number twos and thereby make their profit—as they do not pay any more for ones and twos, generally, than the value of the number twos, and all the ones are so much pure velvet.

Now we have another class of trade, called the huckster and hawkers' trade. They buy of wholesale and retail commission people. They travel up and down the alleys and the streets in the city districts, selling apples to the consumer. They want to buy an ungraded apple, if they can, which they can buy at a low price and then cull them out to suit themselves.

I will endeavor to show a few pictures, illustrating how these apples are distributed to this trade which I have spoken of.

\* \* \* \* \*

I have tried hastily to go over the ground, showing you some of the ways in which the people live and some of the methods which are used in distribution. But that does not sell your apples. To sell apples, or sell anything else, is a business which has to have some one to look after it. A man can't be a Jack-of-all-trades, a producer, and a transporter, and a seller. You are producing an apple to sell. Then you should have some one to sell it. If you are a large grower and can get into the market yourself, understand who the dealers are—you may get along in good shape. If you are a small grower, you never can get anywhere until you have enough of your growers together so that you can hire a man to sell your apples

in the same way as that association did whose shipping station I showed on the screen.

I received letters from farmers all over New England, a majority of whom have not time to make visits to the city, thinking if they send a few apples to the commission men, that he ought to sell them, find a good customer, collect the money and return it to him, and take out a small charge and give him the most of it. Now that does not happen. Understand, this commission man is not going to work for your interest unless you make it an object for him to do it—unless you are around to see what is going on. His interest is to make a living and to make money for himself. He is either going to sell those apples as quickly as he can on commission, or he is going to buy them, or have some of his friends buy them and hold them. Remember, at the time you are picking your apples and offering them for sale, you are loading on the market twelve times as much as the market will absorb. Somebody is going to buy and put their money in them. A few years ago it was a great gamble about apples. As they come to be graded more and more the prices will be more or less established, considering the available supply as it has been reported by the various crop statistics. There is no reason why growers and buyers, if the apples are well graded, if they cannot secure a proper price in the fall, cannot ship those apples to cold storage centers, borrow money on them, and hold them until it is time to put them on the market. But to do that, the individual grower, unless he understands the market, pays high for his experience. Ways of living, as I have shown by these pictures, have changed. People are not so interested in their food supply as one might think. The majority is interested in having a good time, and food is simply an incident to their living. Many are not interested necessarily in the cheapness with which they can get it. It is the easiness with which they can get it. Somebody has to perform the service. And the man who is down there and understands the business can do it better than the man up here who does not undersand it.

#### PRODUCER TO CONSUMER.

A great deal has been said about "from producer to consumer." In the small places that is all right. In a large place,

except in probably five per cent of the trade, it never will be the case, because it costs more to ship in small lots, and, as I say, the people want the service and they don't want to trade with an individual producer.

I had a letter of inquiry from one of your good farmers down here—several letters have passed in the correspondence—in which he wanted to know the name of some good retail concern which would buy 400 barrels of nice apples—he showed me testimonials. He thought if he could get in connection with these retail stores that he could sell those apples, get the commission man's profit, and he could make some money, and that was the way to do business. I wrote him that I didn't think he could do it that way and get so much money out of it. I advised him to get in touch with some good wholesale commission man. He wrote back and said he thought I was hired by those commission men, and he still wanted to get at the retail stores. I tried to explain to that man. I said, "The retail store fellow does not want to trade with you." He could not understand me. Why does not the retail store men want to trade direct with the producer? Remember this retail store fellow who owns this corner store, who leases it, is in business to make the most he can for the fifty-two weeks in the year. That is what he is studying to do. Apples are simply an incident to his business. He handles them because his trade calls for them, but there is not considered to be as much profit on apples as on other things, because, sometimes they don't grade out as he buys them, and a good many times they keep picking them over and they don't bring so much money. He has no place to store more than four or five barrels anyway; he has no money to put into those apples, and he has no time to go into the market district and find out who are the shippers and get the apples drayed across town. So he arranges with the commission man who supplies him the apples just when he wants them, the number that he wants, extends him credit at certain times, and does not require him to furnish storage for those apples, but keeps him supplied from week to week. That is why the average retailer does not want to trade with the producer because he has no time to look up the means of transportation, getting the apples down there, and the majority do not want to buy so many at a time. The restaurants sometimes buy apples and put them in storage but the great majority simply buy three days at a time.

## SELLING APPLES.

Success in selling apples to these people simply means having some one to act as your sales agent who understands these various channels and the ways in which the people live and the ways the buyers operate their business. And when you do have such a man he is the one that will be able to sell those apples, either through a commission man, retail store, or whatever seems to him the best agency to operate with over a series of years. You can't be flipping back and forth from one commission man to another, because by and by nobody cares anything about your stuff. You must have somebody to rely upon to push your business. Remember this one economic fact—if you don't look out for your business, nobody else will. You can't expect somebody else to crack it up and sell it, get the best price and do it all for you. If they are doing that, it is for their pocket-book and not yours. If you want to have that benefit, you have got to have enough produce so as to pay for having that organization.

## QUESTIONS.

Question: I understand that the commission men will put apples into cold storage for you. How do they handle the cold storage?

MR. ORCUTT: What do you mean—"how they handle?"

Question: Well, if I send apples to some commission man in Boston, he to put them in cold storage for me and sell them when the market was right, what would be the terms?

MR. ORCUTT: Well, I suppose different dealers have different arrangements. A great many growers simply have a commission man act as their agent. You understand that a large commission house contracts for cold storage in the fall, or two or three go in together, and of course they get concessions, I suppose, by taking a large space. Then many times they can give concessions to the grower. It depends upon whether you are selling to the commission man or whether he is acting as your agent. You can handle your apples in three or four different ways. You can send them to a commission man and tell him to sell them as quickly as he can and return the money. He offers those for sale. He may buy them himself or have some friend buy them in or he may sell to some outside buyer.



You may send them to him and say, "Put them in storage for me. I will notify you when I want them sold." He acts as your agent at a regular commission and sells them at your direction, you taking all the risk.

Question: Who handles the contract for the storage?

MR. ORCUTT: Most of the large commission houses have regular storage place contracts, because it is very obvious a cold storage company cannot afford to sell space for fifty or a hundred barrels as cheaply as he can for ten or twenty thousand barrels. The commission man acts as broker, according to your contract with him.

Question: It is hardly advisable to send to a commission man to get storage for a small lot—it would be better to consign, wouldn't it?

MR. ORCUTT: Well, I don't know. The small lot man has a hard job to sell his produce. The different farmers from this state and other states write in like this—I will quote you as an example a man who writes in to me and says, "I shipped in 65 barrels of apples to so and so, and I got returns \$1.37, and I see in the New England Homestead they have been selling for \$2.10. Now who has got away with all that money in between?" Well, now, let us see. I find he has shipped three kinds, two different grades—really six kinds of apples. The majority who send in apples do it in this way. They get hold of some of the trade papers and they find a list of commission men. Generally the commission men listed in those papers are good first-class commission men. They pick out one, we will say. They must have some money about the first of January, so they get those apples together, pick them out, ship them and write, "I send you 65 barrels of apples. Want to get the highest market price by return mail." The commission man gets the letter and about the same time he gets a telephone message that the apples are in the station, and some of the help in the place have them carted over, and they don't know what kinds they are. They have to send a man to open every barrel to see what kind they are. They may ask \$2.50 a barrel. Somebody comes along and says, "I will give you \$1.50." They say, "All right, take them." They deduct their charges for carting and add a good lot for doing this work and return the farmer \$1.17,



and he sees good apples quoted \$2.25 and wonders who got away with the money. Now then, the farmer says to me, "Why doesn't the commission man pay attention to my apples?" You take a big house having thousands of different packages of commodities coming in every day, and fifty barrels is a very small order—they are not going to stop their business—the heads of the firm don't know they have received anything from that man at all—it is simply a process of doing business in a large way in which a small order is lost, and all the money is taken up in various charges and costs.

Question: Can you tell us anything about auction sales in New York? Is there any disposition to have such a place in Boston?

MR. ORCUTT: I have heard some talk of it. An auction is a good way to get rid of some surplus produce, but it is not the way to sell produce. You let the other fellow set your price.

Question: Hasn't that been fairly successful?

MR. ORCUTT: Yes, but some of the best sellers don't sell that way. If I was a large grower, or a member of a large association, I should not want to use the auction a great deal; might have to. I think the auction is a necessary arrangement for general business. But what I am getting at is the way to sell produce. It doesn't make any difference whether you have apples or fertilizer to sell, you must get your product before the people in good shape, and when I sell apples I don't want to come up against an auction price. I want to get my apples in as good shape as possible—find out who the consumers are. A small amount in an auction sale isn't going to amount to anything. The produce has to be inspected and the seller has to know what it is beforehand. You have 65 barrels of apples of two or three kinds. They are eaten up by charges, opening them up to see what they are, having them listed, etc. The marketing of farm products is no different than the marketing of other products. A farmer is a manufacturer, pure and simple. He has his land from which to manufacture products. He has to use the same methods as in marketing any other kind of product, adapted to the particular line of article that he is producing. We fail to realize these two things, our changed condition of living which we illustrated here, from the old way, in which certain local producing centers had a

monopoly of certain consuming centers because there were no transportation facilities to get them to other centers, and no connections between trade organizations and importers. Now then, when we understand that the basis of food supply of this world is in our Middle West, in Canada, in South America, in Austria-Hungary, in Siberia, in Australia and in Africa—that those are the centers where they are producing more food than the population there consumes—now in the last ten years, by the establishment of the railroad service with the refrigerator car, the heater car, the refrigerator ship, and so on, importing and exporting houses in the different centers, any food product is going—except very bulky stuff—from the producing center to the consuming center that will pay the most money for it. And the exporting and importing houses are the most highly organized and the best business men in the world because they are the oldest business firms in the world and understand how to do it better. Why can the foreign condensed milk company come in and trim the best companies we have here? Because they were selling condensed milk long before these condensers were started in this country and they understand the game. You can't beat a man at his own game only once in a while. We get butter in our New York markets from Siberia, New Zealand and South America. There is fruit now in our markets from South Africa—came two years ago for the first time, because of the reefer ships. Quantities of eggs from China—eggs broken and the yolks put in one cask and the whites in another and brought here and put in our bakeries. This is an illustration of how, more and more, these people are buying goods in a wholesale way and bringing the people here into competition with the producers in these other sections. The man who is the best salesman, who gets his product up in the best way and gets it to the consumer, is the man who gets the business, no matter where he is located. The apple producers in the western states, with a fifty cent freight rate on a box of apples, are in a better condition to market their product because they have an agency to sell those apples which knows how to sell them.



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